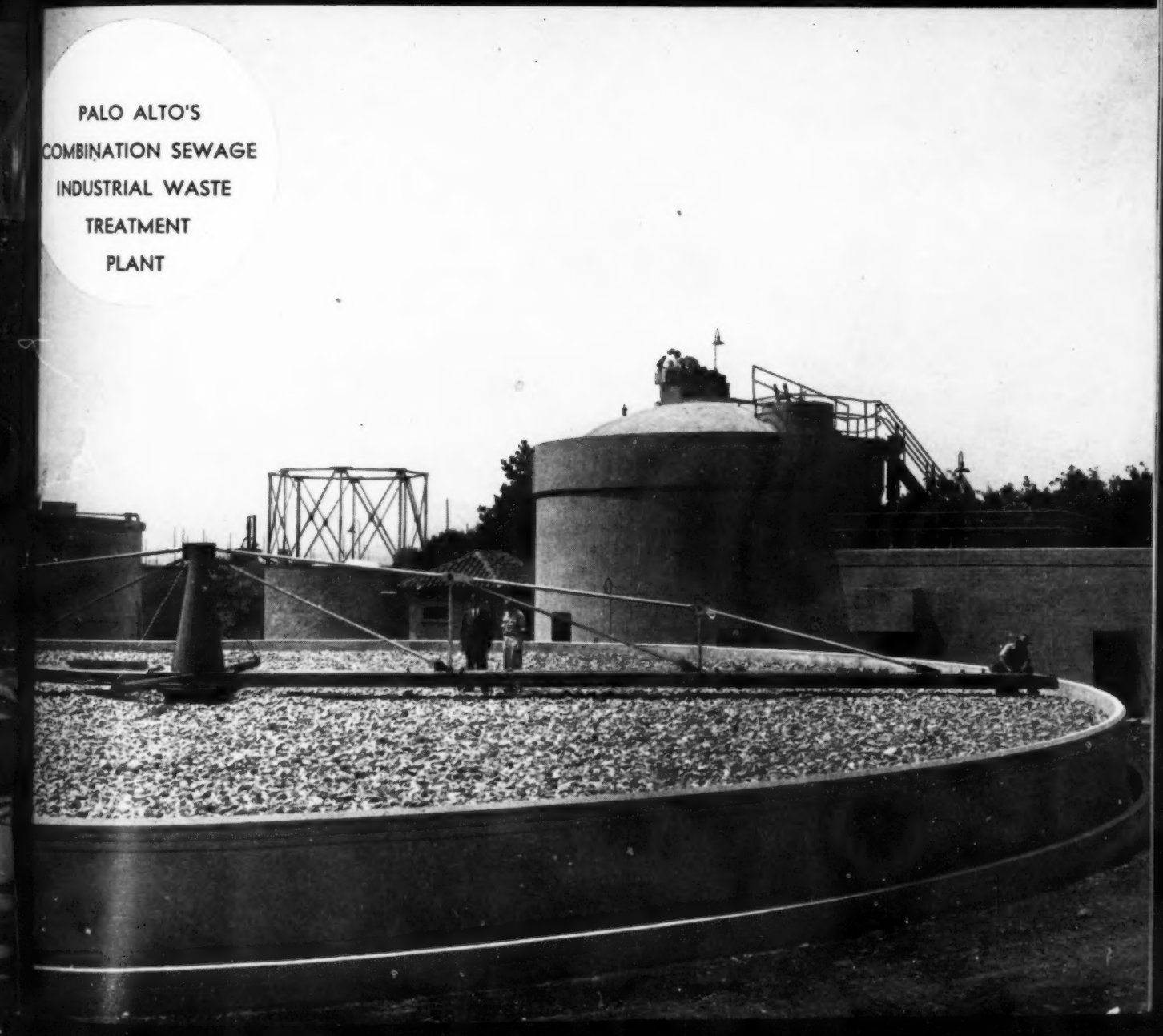
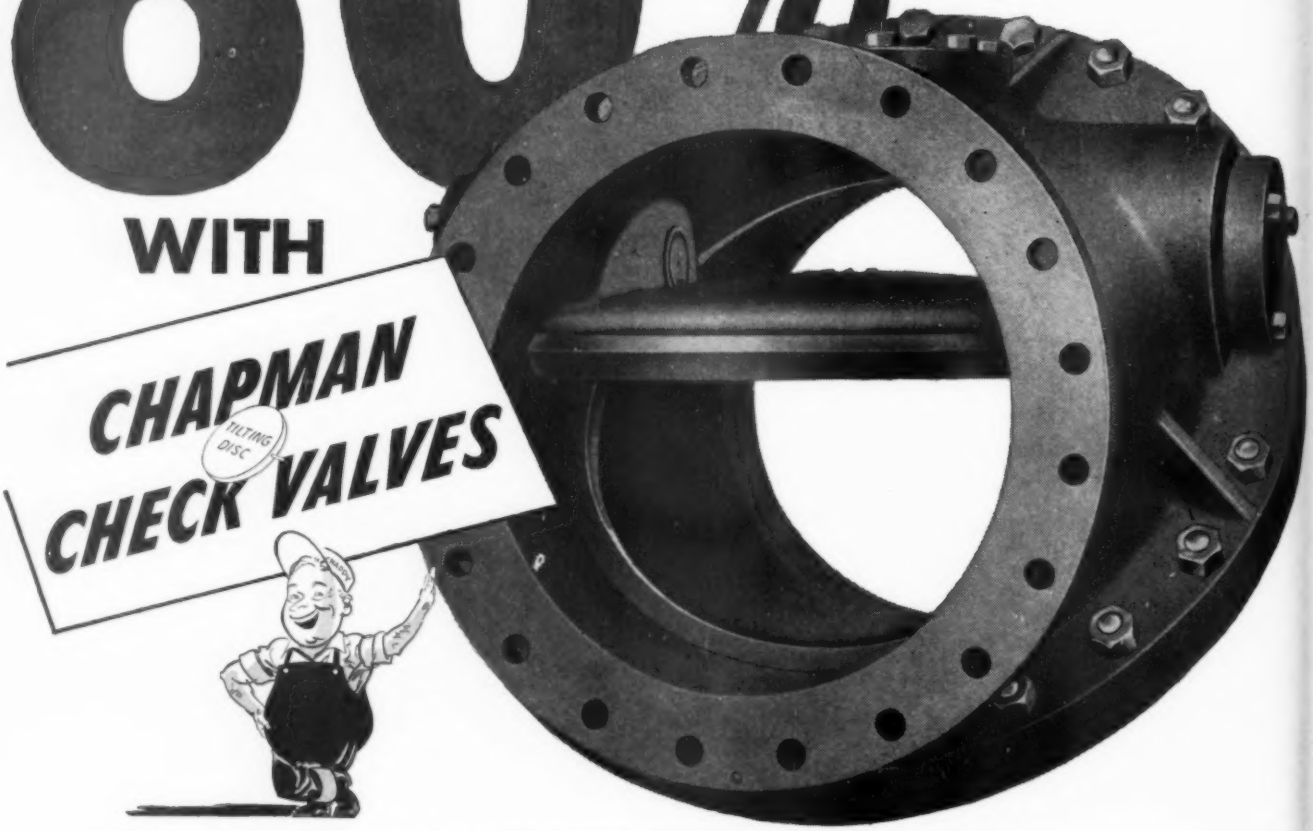
WATER & SEWAGE WORKS



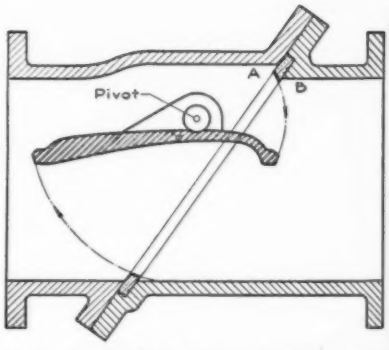
SAVE UP TO 80% IN HEAD LOSSES WITH CHAPMAN TILTING DISC CHECK VALVES



Because of its free-flow design and balanced streamlined disc, head losses are reduced to a minimum in Chapman Tilting Disc Check Valves. Actual experience has shown savings of from 65% to 80% in head losses over conventional type check valves.

There's only *one moving part* in Chapman Tilting Disc Check Valves—the balanced hinge-pinned disc. When opening, this disc lifts away so that there is minimum wear on the seat. And once opened, it rides smoothly on the flow, minimizing wear on bearings and pins. It closes quickly and quietly because of the effect of the stream on the short flap. Hammering and consequent strains on pipe lines are eliminated.

Chapman Tilting Disc Check Valves are available in either iron or steel. Send for bulletin containing engineering data and reports of tests.



Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

The Chapman Valve Mfg. Co.

INDIAN ORCHARD, MASS.

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. February 1949. Volume 96. Number 2. Published monthly by Gillette Publishing Co. at 404 North Wesley Ave., Mount Morris, Ill. Per copy, 25c; except *this issue*, 75 cents. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second-class matter March 4, 1948, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879. Executive and business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

EMPIRE TYPE 12
Frost proof model for cold climates. Described in Bulletin W-802.
EMPIRE TYPE 14
Bronze bottom plate model for warm climates. Described in Bulletin W-801.
THE PISTON THAT Glides
FOR GREATER ACCURACY
LONGER LIFE
PITTSBURGH EQUITABLE METER DIVISION
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Handy Hypo for Healthful Water

Hypo-chlorination with HTH is the handy "do-it-today" way to disinfect reservoirs, basins, flumes . . . to sanitize filters, tanks and aqueducts. Convenient HTH permits on-the-spot sterilization of newly-laid water mains and other strategic points in your water supply system. And when a main breaks, a flood strikes or other emergencies arise, HTH is on the job in a jiffy—*if* you have it on hand. So order your supply today . . . and write for the 1948 edition of Mathieson's factful booklet: "Hypo-Chlorination of Water". Mathieson Chemical Corporation, 60 East 42nd St., New York 17.

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SANITATION HTH

Sanitation HTH . . . PH-Plus (Fused Alkali) . . . Liquid Chlorine . . . Chlorine Dioxide . . . Caustic Soda Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aque . . . Dry Ice . . . Carbonic Gas Sodium Chlorite Products . . . Sodium Methylate

SANITATION HTH IS AVAILABLE IN CASES OF NINE HANDY 5-LB. CANS AND IN 100-LB. DRUMS.

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING

Ecusta's Modern Filtration Plant

Down in Pisgah National Forest, high up in the Blue Ridge Mountains of North Carolina, is a modern filtration plant which would be the pride and joy of *any* municipality. In this instance, however, the spic-and-span water purification plant serves an industry which rates excellence of water supply ahead of that of any other raw material entering into the manufacturing process. This filtration plant supplies the vast volume of water required in the production of the highest quality of cigarette papers used on a variety of cigarettes. So impressed were we with this plant, and its scrupulous maintenance and operation, that we have after a number of tries secured the forthcoming article by

H. F. FINCK and M. M. MATTHEWS, Eng'rs.
The Ecusta Paper Corp., Pisgah Forest, N.C.

A Unique Method of Fluoridation

Is being employed by Madison, Wisc., which had the problem of selecting the most practical scheme of adding fluoride to a number of scattered wells comprising the Madison supply. The scheme selected involves feeding of concentrated Hydro-fluoric Acid directly to the well through the eduction line to the deep-well pump. The feed control is automatic, positive, and essentially fool proof. The timely illustrated description of this extremely interesting and novel fluoridation scheme is that of—

LEON A. SMITH, Supt.
Madison (Wisc.) Water Dept.

Preconditioning and Digestion of Sewage Sludge

Is to be discussed in a series of articles by a well qualified author with considerable plant operating experience. These articles are based on lectures by the author before the Short School for Sewage Works Operators at Penna. State College. Although written especially for the benefit of plant operators, these articles are not without value as a guide to plant designers. The contributor, already known to our older readers, is—

T. R. HASELTINE, Partner
The Chester Engrs., Pittsburgh, Pa.

A Simplified Titration Unit for Determination of Residual Chlorine

Is an illustrated description of a relatively simple laboratory unit for determination of the various classes of residual chlorine by the amperometric titration method. This inexpensive unit was designed and assembled by the author—

W. A. MAYHAN, Chief Chemist
Munic. Water Works, Little Rock, Ark.

Industrial Consumption Effects on "Accounted-for Water"

Have been diligently studied at Kenosha, Wis., where it was found that while all other factors were ruled out, the variations in accounted-for water paralleled the variations in industrial consumption. The reasons for that relationship have not yet been found by

H. T. RUDGAL, Supt.
Wat. & Sew., Kenosha, Wis.

Forced Circulation Type Hot Water Heat Exchangers for Digestion Tanks

Reviews the equipment available, discusses the theory of heat exchangers, and develops measurements of performance. This comprehensive discussion of an important tool to sludge digestion has been prepared by

JOHN J. BAFFA, Cons. Engr.
New York City

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VOL. 96, NO. 2

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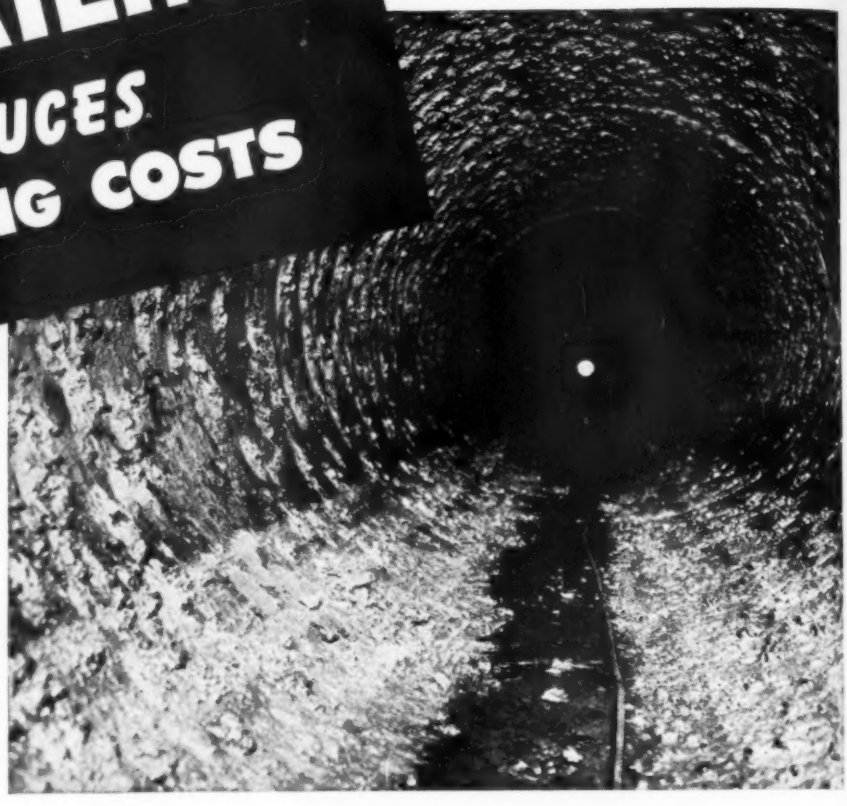
CENTRILINE REDUCES PUMPING COSTS

▶▶▶▶ WRITE TODAY FOR THE NEW CENTRILINE CATALOG

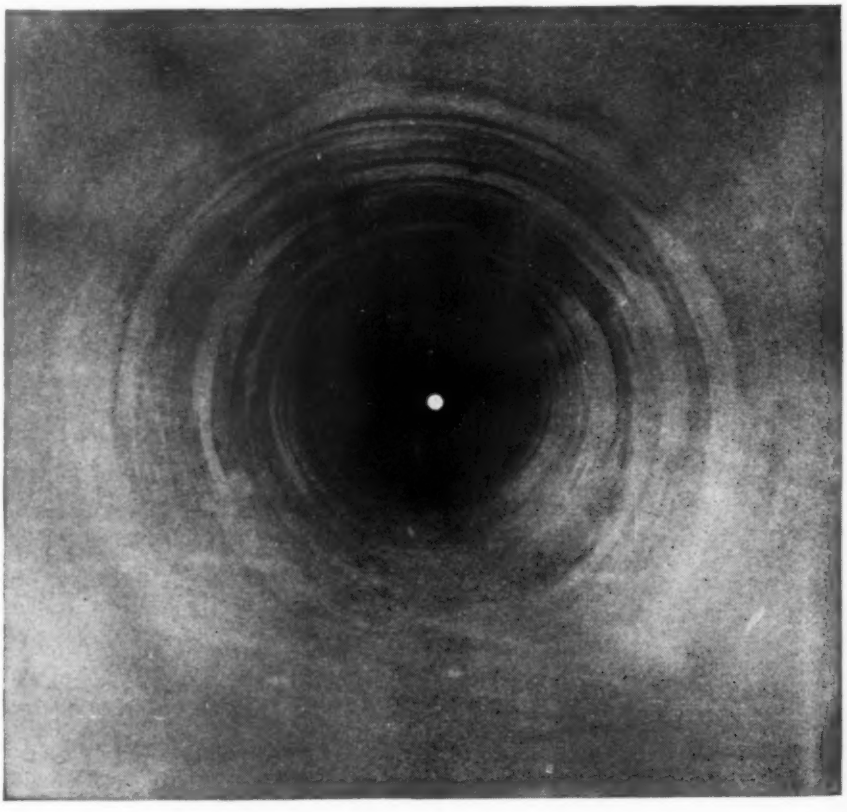


▶ PIPE LINING FACTS NO. 2 ◀

HIGH CARRYING CAPACITY means low pumping costs. Centriline, by assuring perpetually sustained high carrying capacity, keeps the pumping expenditure a low item on the community budget.

Protective cement mortar linings, as applied by Centriline, are continuous, dense, smooth, and without variation in quality. This ever-smooth surface permanently resists corrosion and tuberculation so that pumping expense and depreciation costs go down; coefficient of flow and useful life increases!

Whether old mains are losing efficiency or new projects are planned it is wise to consider Centrilining for the sake of the municipal budget. Our competent staff of hydraulic engineers is ready to assist you.



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CEMENT MORTAR LININGS FOR WATER MAINS

Centrifugally Applied In Strict Conformity with A.W.W.A. Specifications

HORTON *Elevated Tank*
at Mattoon

New 500,000-gallon radial-cone bottom unit improves distribution system

Gravity water pressure provided by an elevated tank will improve the operation of a municipal water system by doing these things: (a) maintaining more uniform water pressure in the system, (b) helping pumping equipment to meet peak loads, (c) reducing power costs by permitting pumping to be done at low-rate times, and (d) providing pressure for use in emergencies, such as serious fires. Result—*The capacity of the water system is effectively increased.*

Horton elevated tanks are commonly supplied in two designs, ellipsoidal-bottom and radial-cone bottom. Horton ellipsoidal-bottom tanks have a capacity range from 15,000 to 500,000 gallons, and Horton radial-cone bottom tanks, from 500,000 to 2,500,000 gallons. Both types are butt-welded throughout, which makes for simplicity of maintenance and for pleasing appearance.

Ask our nearest office for estimating figures.

Above: A 500,000-gal. Horton radial-cone bottom elevated tank, 90 ft. to bottom, erected for the city of Mattoon, Illinois. The tank serves the entire distribution system, covering an area of 7.5 sq. miles.

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Atlanta 3	2181 Healey Building	Detroit 26	1551 Lafayette Building	Philadelphia 3	1644-1700 Walnut Street Building
Birmingham 1	1586 North Fiftieth Street	Houston 2	2115 National Standard Building	Salt Lake City 1	1550 First Security Bank Building
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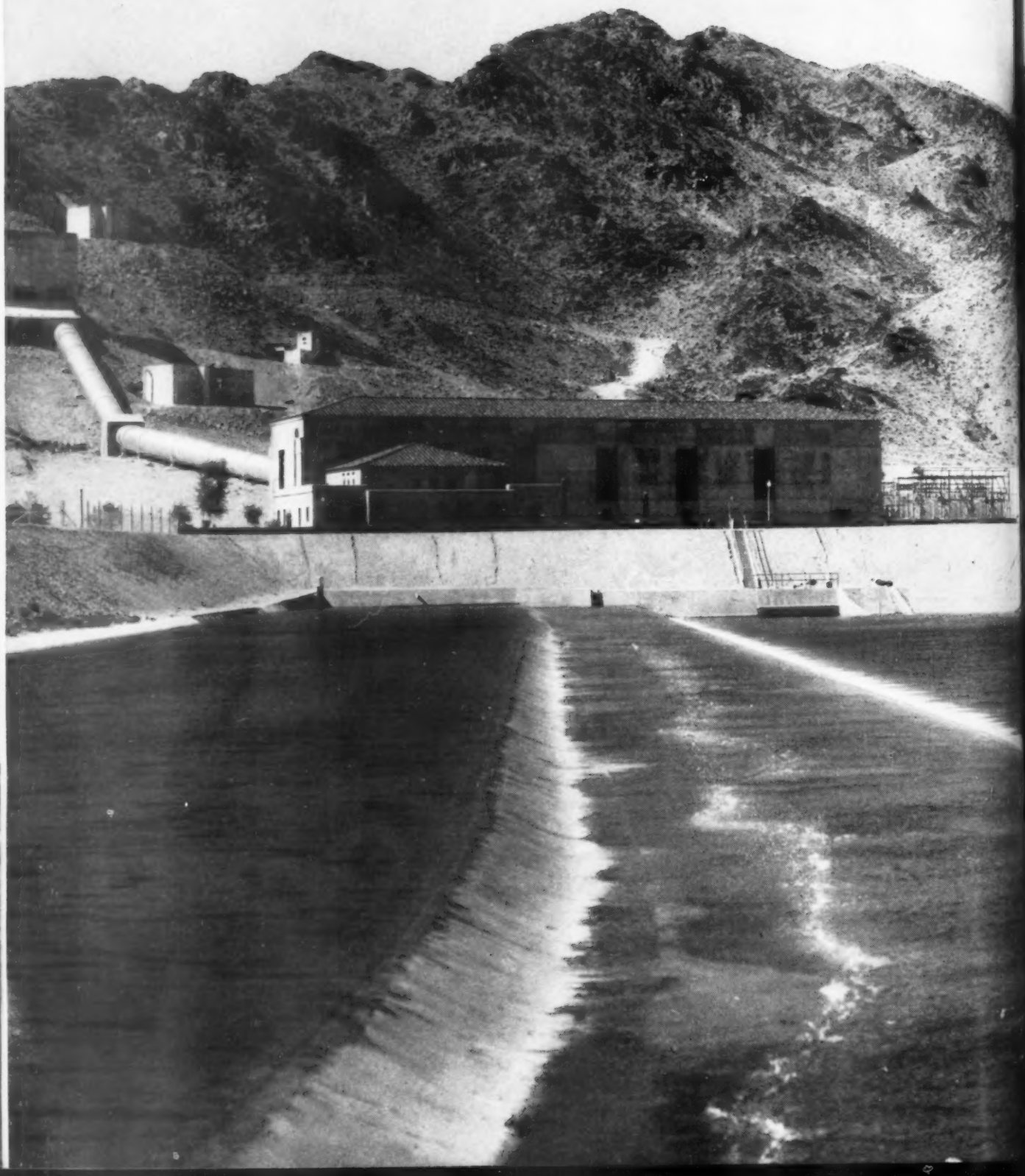
Chicago 4	2198 McCormick Building	Los Angeles 14	1455 Wm. Fox Building	Seattle 1	1350 Stuart Building
Cleveland 15	2262 Guildhall Building	New York 6	3390-165 Broadway Building	Tulsa 3	1646 Hunt Building

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

Water...481 Miles f



es from Home!

Southern California Water Supply Depends on Reliable Allis-Chalmers Equipment

HAULING WATER over and through mountains for 481 miles is an enormous task. Yet, that's the length of the longest pipeline of the Metropolitan Water District of Southern California. Bringing water from the Colorado River to the homes and businesses of Southern California has made possible the rapid growth of that area.

Included in this gigantic system are 45 mountain tunnels, 7 reservoirs, 5 pumping stations, water softening plant, filtration plant and hundreds of miles of acqueducts and pipelines. Today the system efficiently serves Los Angeles and 20 neighboring communities having a combined population of over 3,000,000.

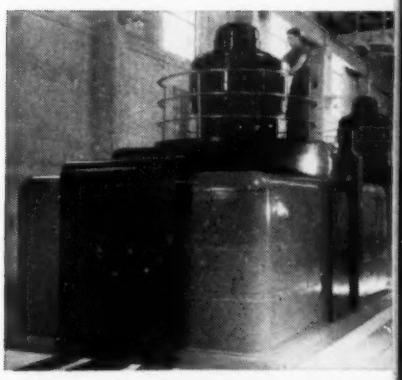
The Iron Mountain Pumping Station (shown here) is Allis-Chalmers equipped. Three 90,000 gpm pumps, operating against a 144 ft head, force water into a tunnel in the mountain. Specifications demanded 88 percent efficiencies from pumps but all A-C units tested 91.3 or better. Three vertical synchronous motors of 4300 hp each drive the pumps. All A-C equipment, operating since 1939, have delivered reliable service.

The same kind of fine equipment engineering that went into the pumps and motors of this great system is available for your community, whether large, medium or small. Today, Allis-Chalmers offers you the world's widest range of public works equipment. For additional information call your nearest A-C office or write direct.

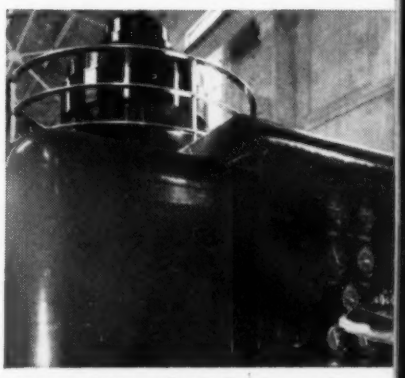
A 2600

ALLIS-CHALMERS, 1192A SO. 70 ST.
MILWAUKEE, WIS.

A-C Provides Pumps and Motors for Southern California Pump Station



SYNCHRONOUS MOTORS, 4300 hp each, are of rectangular design, accommodate cooling coils. Housings protect against entrance of sand and dust.



GAUGE CABINET for indicating cooling water and oil condition of motor. Cooling is accomplished by fans which recirculate the air within the motor.

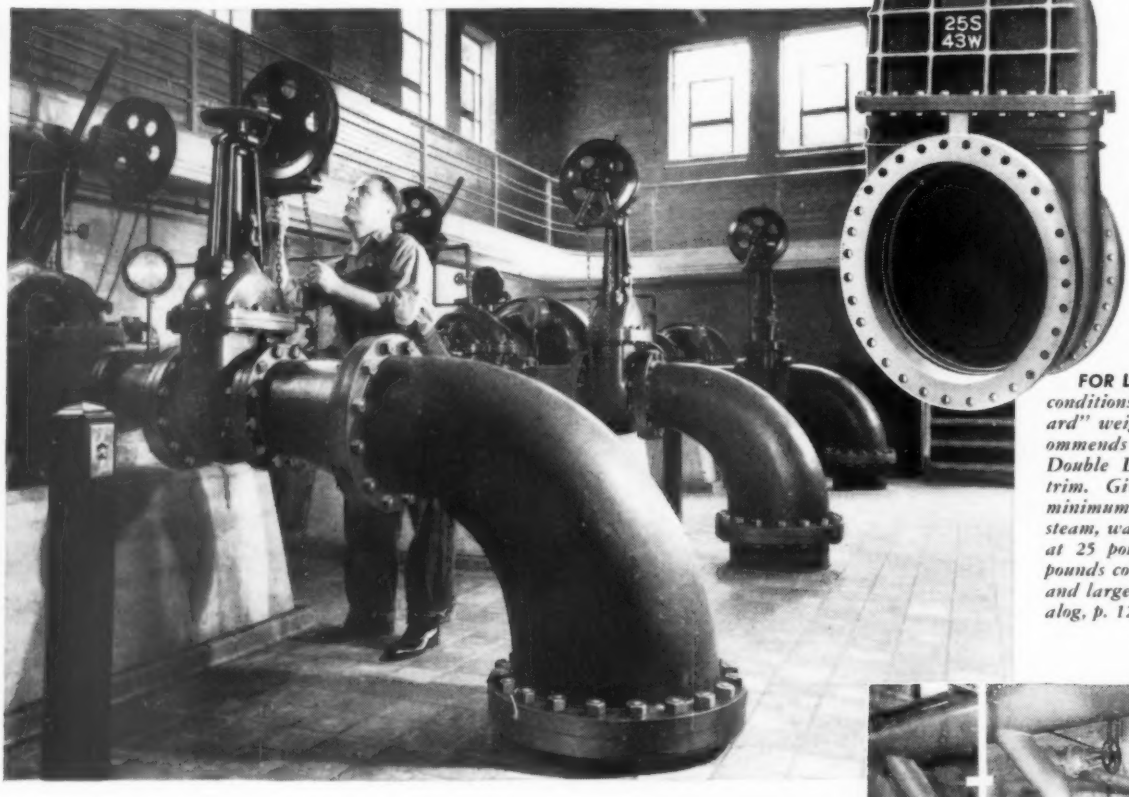
GIANT PUMPS are rated 90,000 gpm and are designed with a 48 in. discharge. The impellers measure 78⅛ in. and are driven by 20 in. shafts.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

Crane Valves

keys to any city's water services



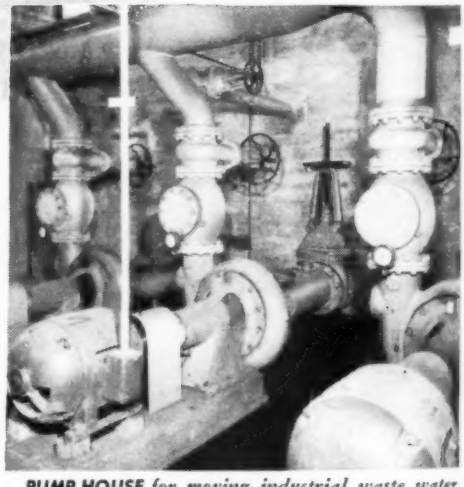
CRANE 10-IN. GEAR *and chain wheel operated gate valves on high lift pumps in a village waterworks. Crane supplies all types of remote control equipment for valves.*

FOR LOW PRESSURE SERVICE *conditions not requiring "standard" weight valves—Crane recommends No. 793½ Iron Body Double Disc Gates with brass trim. Give excellent service at minimum cost on low pressure steam, water or gas lines. Rated at 25 pounds steam, up to 50 pounds cold water. Sizes: 10 in. and larger. See your Crane Catalog, p. 122-3.*

In mill town or metropolis . . . in water supply or sewage disposal plants . . . in short, wherever flow control equipment guards public health, you find Crane valves. Why? Simply because their performance record, established under all operating conditions, warrants it.

Since the beginning of modern flow control methods, Crane valves have shared in the steady development of the nation's public water services. And today, Crane Quality is *still* your best value for valves that give dependable service with minimum maintenance and replacement costs.

CRANE CO., 836 South Michigan Ave., Chicago 5, Ill.
Nation-wide Service Through Branches and Wholesalers



PUMP HOUSE *for moving industrial waste water to treating plant. All piping materials, including shop fabricated manifold, gate and check valves, are Crane.*

VALVES · FITTINGS · PIPE

CRANE

PLUMBING AND HEATING

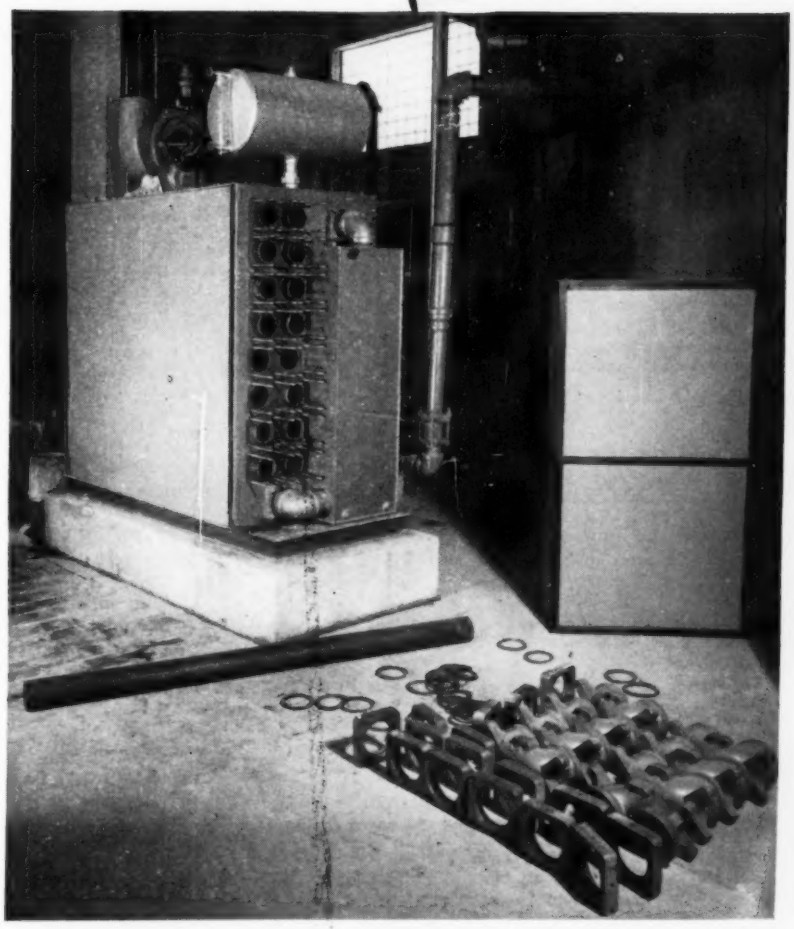
One of two PFT No. 500 heater and heat exchangers installed in the Dayton, Ohio, sewage treatment plant. L. C. Huffman, Engineer

Unequalled performance **ON THE JOB** — that's the clinching proof that brings two more **PFT** Sewage Gas Fired Digester Heaters, of the type shown above, to the Dayton Sewage treatment plant.

Early in 1947, two **PFT** No. 500 external digester heaters were installed by the City of Dayton, Ohio, to heat two of the four 85-ft. diameter digesters equipped with **PFT** floating covers. After over one year of continuous operation, PFT engineers conducted extensive performance tests and dismantled one unit completely for thorough inspection. The dismantled view, right, taken at the time shows the complete lack of fouling which permitted continuing the Number 2 unit — operating in parallel with the tested unit — to continue in operation without servicing.

As a result, two additional units are now being installed to supply heat for the other two 85 foot diameter digesters and the original six 50-ft. diameter digesters, all of which are equipped with PFT floating covers. The original six digesters were heated with conventional type boilers and coils. These boilers needed major overhauling and are being replaced with the PFT units.

Solve **ALL** the major troubles common to heating coils immersed in the digesting mass — send for details about the PFT Digester Heater and Heat Exchanger.



PFT No. 500 Heater and Heat Exchanger as dismantled for inspection.

PACIFIC FLUSH TANK CO.

P.F.T.

SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

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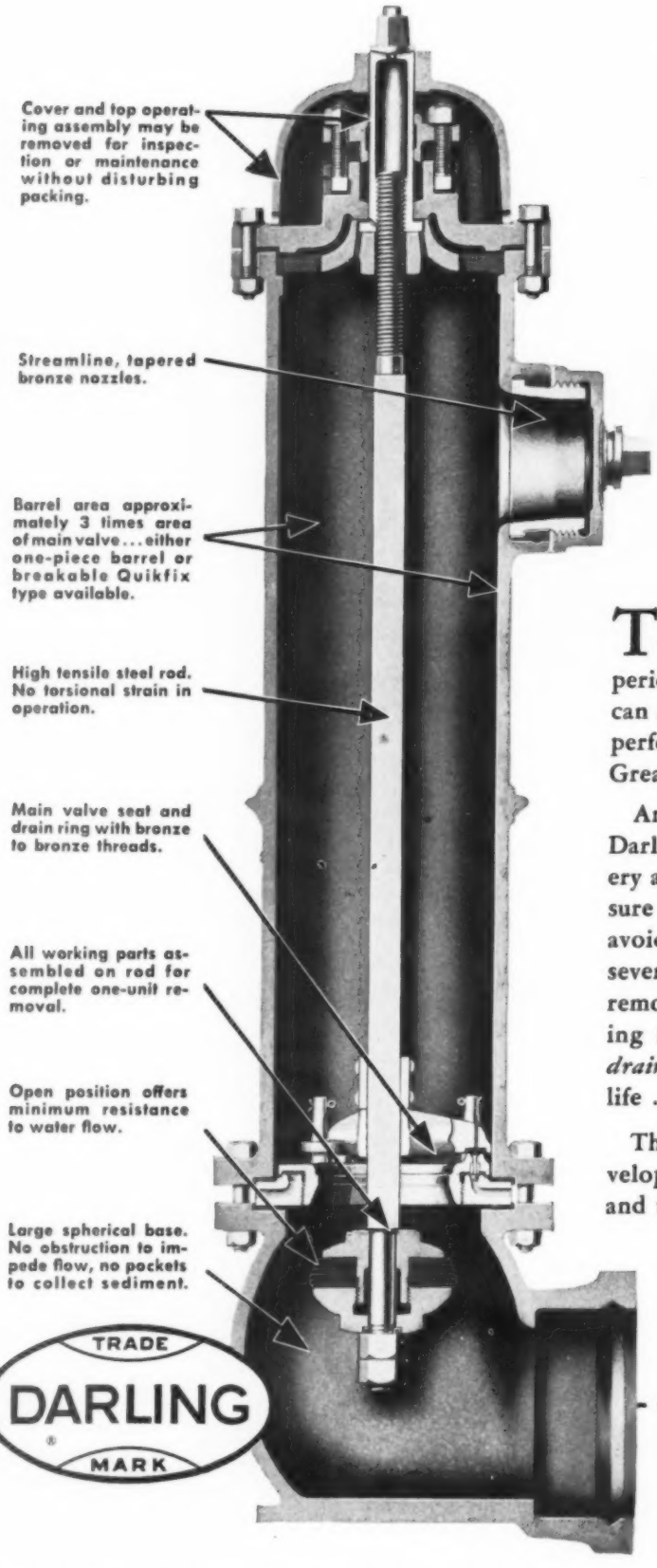
NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • DENVER • TORONTO

Peace of mind sums it up!


Cover and top operating assembly may be removed for inspection or maintenance without disturbing packing.
Streamline, tapered bronze nozzles.
Barrel area approximately 3 times area of main valve... either one-piece barrel or breakable Quikfix type available.
High tensile steel rod. No torsional strain in operation.
Main valve seat and drain ring with bronze to bronze threads.
All working parts assembled on rod for complete one-unit removal.
Open position offers minimum resistance to water flow.
Large spherical base. No obstruction to impede flow, no pockets to collect sediment.

THIS man shares responsibility in his town for fire-fighting efficiency and operating cost. Experience has shown him that on both counts he can rely on Darling hydrants for the finest kind of performance . . . year around, year in, year out! Greater peace of mind is another way of putting it.

Are you familiar with all the *advanced* features of Darling hydrants? These include peak water delivery at the nozzles with no perceptible loss of pressure . . . positive, automatic flushing of drains to avoid freeze-ups . . . prevention of flooding despite severe traffic damage . . . fast, simplified, *one-man* removal and inspection of *all* working parts including main valve, *main valve seat,* drain valve and *drain valve seats* . . . unsurpassed ruggedness and life . . . modern, good-looking exterior.

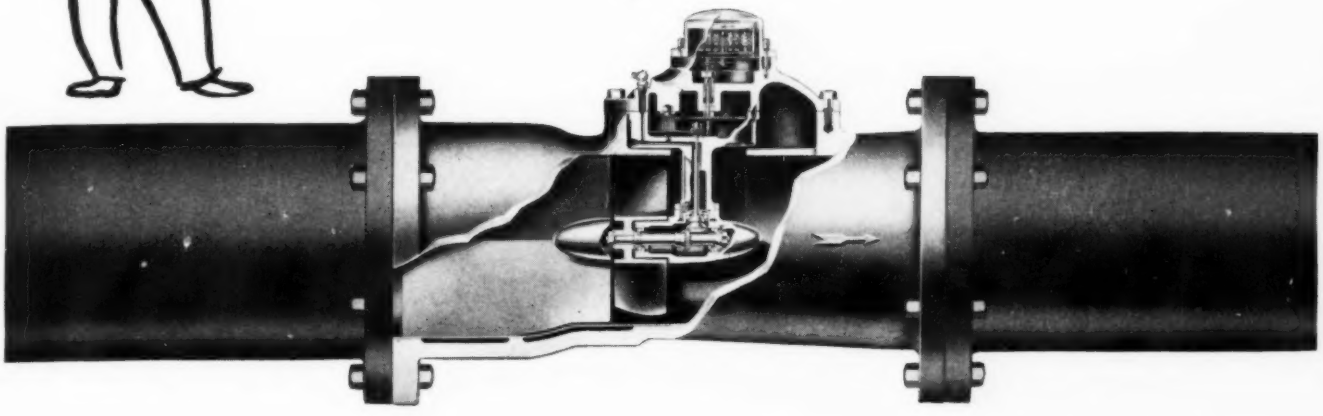
These are only a few of the Darling features developed to ease your mind on hydrant performance, and to ease your budget on over-all cost! Catalog 17M describes *all* the features in detail, tells all about Darling hydrants for every known service both normal and unusual. We'll be happy to send you a copy.

TRADE DARLING MARK

DARLING
VALVE & MANUFACTURING CO.
Williamsport 11, Pa.

DON'T ROB YOURSELF!

INSTALL BUILDERS *Propeloflo* METER



Guessing can be a costly way of determining flow — especially in those communities where sewer taxes are collected. The only fair and safe way to determine your water consumption for tax purposes is by metering all lines. Builders Propeloflo Meter, widely used for main line metering, has been approved by many municipalities for metering all auxiliary lines, including deep well water supplies.

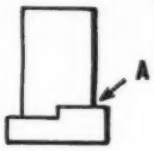
With Builders Propeloflo Meter you *know* at all times the water consumed or clear effluent discharged. The meter is self-driven and reads directly in gallons. Builders streamline Venturi design totalizes flow accurately over a wide range — with a very low pressure loss which reduces pumping costs. Installation is as simple as bolting in a similar length of pipe — Builders Propeloflo fits all lines 2″ to 36″. For Bulletin 350A, address Builders-Providence, Inc., (Division of Builders Iron Foundry), 10 Codding Street, Providence 1, R. I.

BUILDERS PRODUCTS

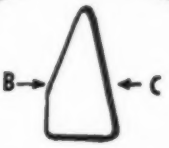
Venturi, Propeloflo and Orifice Meters • Type M, Flo-Watch and Flo-Gage Instruments
Shuntflo Steam Meters • Kennison Nozzles • Chronoflo Telemeters • Conveyoflo Meters

BUILDERS PROVIDENCE
Instruments

Here is why THE FAMOUS RENSSELAER DOUBLE-DISC GATE VALVES *open easier... seal tighter!*



IN OPENING, THE THICK (A) SIDE OF THE STEM NUT LIFTS THE GATE ON ONE SIDE FIRST, MECHANICALLY BREAKING SEAL

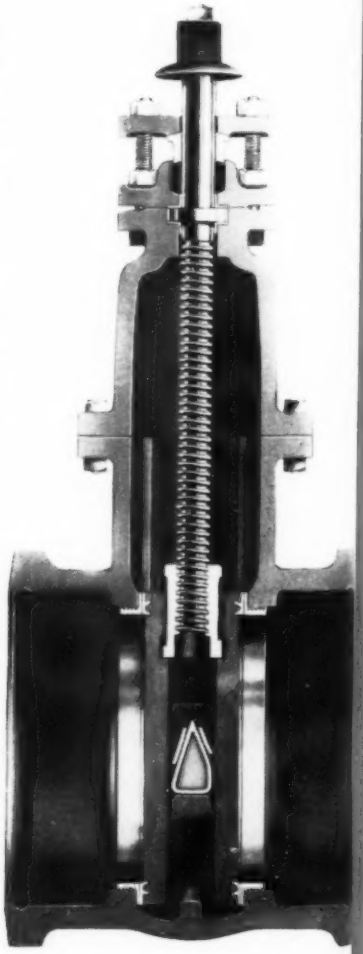


GATE ON SHORT SIDE (B) OF WEDGE IS PULLED FIRST, LOOSENS EASILY. IN CLOSING, LONG SIDE (C) OF WEDGE CAUSES POWERFUL SEATING FORCE ON THAT SIDE.

THE principles of the long Wedge for greater seating power and the short Wedge for easier unseating apply to RenSSelaer Valves in sizes 10" and larger. But in ALL sizes of these famous Valves, ONE gate is ALWAYS lifted FIRST, mechanically releasing the wedges, so opening is positive. Wedging action does not seat gates until they are in *"fully closed"* position, so sliding frictional wear is minimized.

But ease of operation is only one feature of RenSSelaer Valves. SOLID BRONZE is used liberally throughout—in stems, stem nuts, wedges, seat and gate rings, glands and stuffing box nuts. Castings are high tensile strength corrosion-resistant iron. INTERCHANGEABILITY of parts insures low maintenance cost. Thousands in perfect service for over 65 years.

Experienced Field Representatives are at your call to bring you the benefit of RenSSelaer experience in Valves AND Hydrants. Their service puts you under no obligation. Call our nearest office.



Above cross-section shows 2-sided wedge on valves 10" and larger

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RENSSELAER

Gate Valves • Square Bottom Valves • Tapping Valves and Sleeves
Hydrants • Check Valves • Air Release Valves

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Threshold Treatment with Calgon*

. . . controls corrosion

. . . inhibits scale formation

. . . prevents precipitation of dissolved iron

. . . stabilizes water following lime softening

We will be glad to send you full information about Calgon and the advantages it offers in the treatment of your own water supply.

*T. M. Reg. U. S. Pat. Off.

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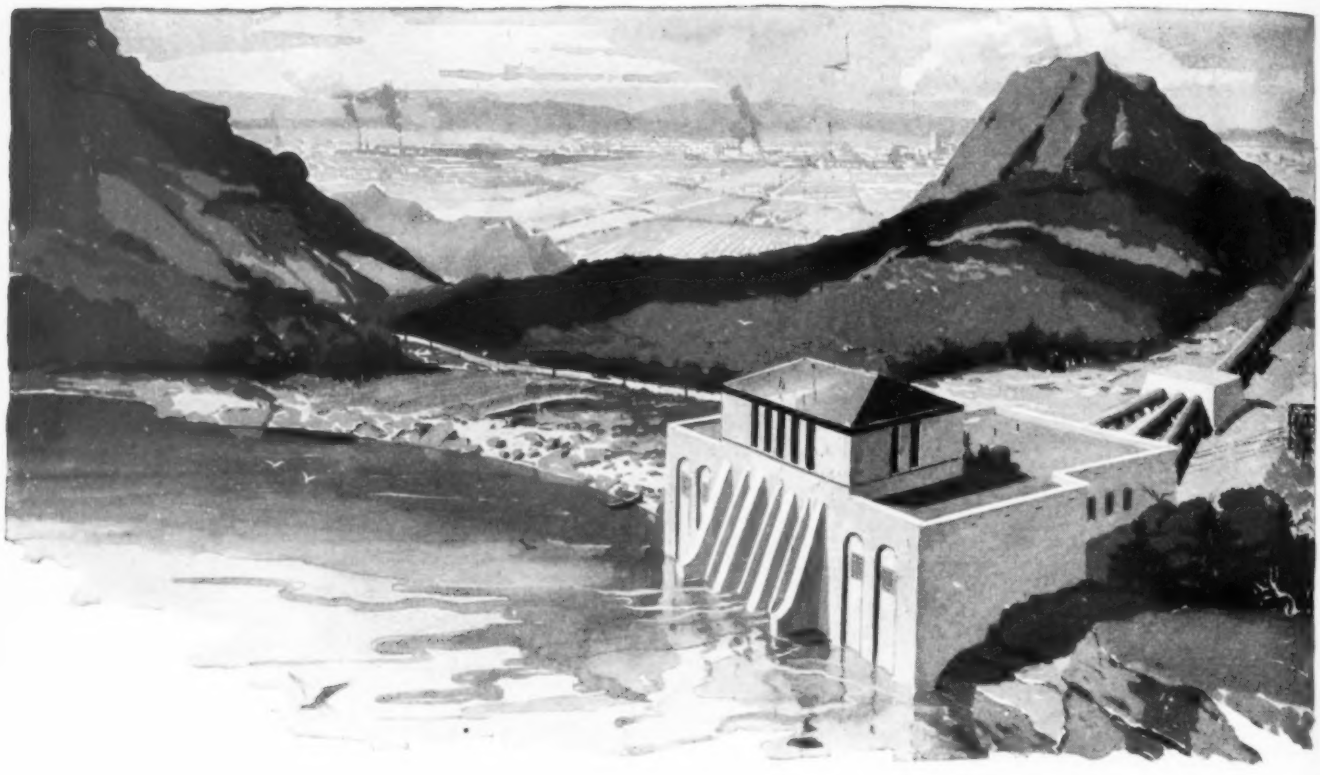
HAGAN BUILDING
PITTSBURGH 30, PA.



WHEN Millions Live As One

ADVENTURESOME folk, since the beginning of time, have migrated . . . Settling in tiny clusters . . . Spreading spider-web fashion to dot the land with villages and towns . . . While others pressed forward, facing dangers concealed behind each rock and tree!

But with the growth of cities, new perils arose and multiplied . . . People were living too closely together . . . Epidemics and pestilence exacted their toll . . .

Then science and modern machinery rescued them from exposure to disease emanating from impure water and unsanitary waste disposal . . . And, today, *millions live as one!*

Rotovalves and Axial Flow Pumps, by Smith, are in service—controlling water, controlling floods and regulating sewage discharge, in important systems, far and wide.

The recognition and acceptance given these products are not accidental. They come from superior design, resulting from our more than 75 years of hydraulic experience . . . Facts that are significant, because they are proof positive of our ability to serve you, *if you place your problem in our hands!*

562

S·MORGAN SMITH COMPANY
YORK·PENNSYLVANIA~U·S·A·
If It's Hydraulics-Put It Up to Us·

POWER by SMITH

Engineering Facts about
Johns-Manville TRANSITE PRESSURE PIPE
Making Large Service Connections

READY adaptability to standard waterworks practice is an advantage of Transite* Pressure Pipe which is of special importance when making large service connections. Thousands of such connections are in service today, installed in Transite supply and distribution lines with standard equipment and tools under a variety of installation and working conditions.

For tapping the line under pressure, conventional tapping sleeves, tapping valves and drilling machines are generally used. The sleeves are first leaded and caulked in the usual manner. Sleeves to fit all sizes of Transite Pressure Pipe are available from several manufacturers. Tough and strong, the pipe wall is, nevertheless, readily drilled; Transite's unusual machinability assures a clean cut.

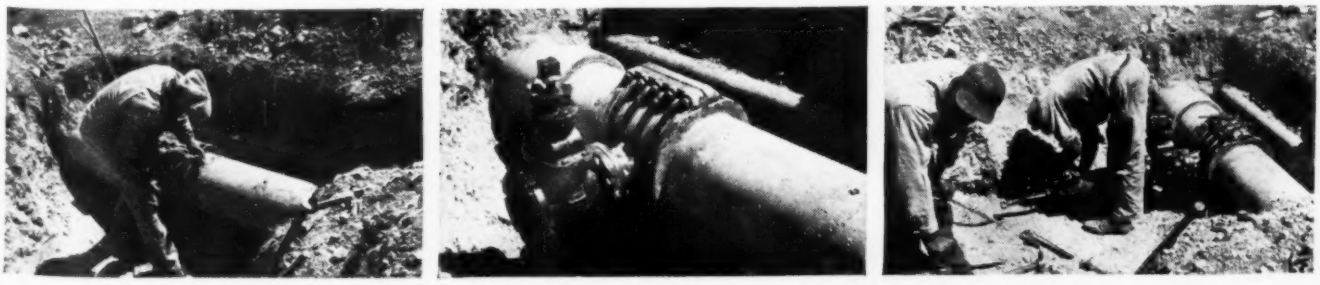
In cases where the line can be temporarily removed from service, a commonly used method of providing large connections is to insert into the line a fitting† such as a tee having the required outlet size. To do this, a section of pipe is first removed from the line. The Simplex Coupling permits quick removal and with a minimum of trench excavation. Two stubs of pipe are then cut from this section and inserted into the bells of the fitting to form an assembly of equivalent length to that of the section removed. No problem arises in joining stub ends and fitting, since lead or compound joints are readily made with Transite. Replacement of the assembly in the line is easily and quickly made with the standard Simplex Couplings.

A 24-inch Transite main being tapped under full working pressure for a 20-inch branch connection.

A method sometimes used for making connections when the line is under pressure is the use of service clamps of the type equipped with double straps. These may be used for making service connections larger than those recommended for corporation stops inserted directly into the wall of the pipe or where multiple corporation stops are not used. After the service clamp and corporation stop are attached, the pipe wall is drilled with conventional drilling tools. Service clamps are not used for outlets exceeding one-quarter the diameter of the street main, nor larger than 4".

A previous advertisement in this series discussed tapping Transite Pressure Pipe for small service connections. A reprint is available on request. Address Johns-Manville, Box 290, New York 16, N. Y.

†The run of the fitting should have bell ends. Enlarged bells are used for class 150 pipe over 8" in diameter.



Conventional methods are used for making large service connections in Transite lines. Here are shown a tapping sleeve and valve being installed on a 12" line under pressure for a 4" outlet.

JOHNS-MANVILLE JM PRODUCTS

*Transite is a registered Johns-Manville Trade Mark

Built to stay young

This water line has the give-and-take that pipe lines need for a long, useful life underground. The long lengths of strong, shatterproof steel pipe are cushioned at every joint by flexible Dresser Couplings which harmlessly absorb the punishing stresses of underground service.

And, in the way of carrying capacity, a Dresser-Coupled steel line gives you the *full* advantage of modern, glass-smooth linings. Dressers fit outside the pipe. There is no heat to damage the lining—no need for workmen to go inside the pipe.

A Dresser-Coupled steel line makes for speedy installation, too. You use plain-end pipe in standard lengths. Work proceeds rapidly because the factory-made, factory-tested couplings are easy to install—even in wet or crowded ditches. Any workman who can use a wrench can make permanently tight, flexible joints *every time.*

For an extra margin of safety, permanence and easy installation, specify a Dresser-Coupled steel line. *Write for Dresser's new "Report of Coupled Steel Water Lines".*

SIMPLE • FAST • FLEXIBLE • PERMANENT

Even in cramped quarters encountered in city work, Dresser Style 38 Couplings make permanently tight, flexible joints every time.

PARTIAL LIST OF CITIES USING DRESSER-COUPLED STEEL LINES

Cleveland, Ohio	Boston, Mass.	Newark, N. J.
Philadelphia, Pa.	Syracuse, N.Y.	Savannah, Ga.
Detroit, Mich.	Washington, D.C.	Denver, Colo.
Springfield, Mass.	Spokane, Wash.	New York, N.Y.

DRESSER

"FLEXIBLE-TIGHT"

COUPLINGS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries)—In Texas: 1121 Rothwell St., Houston—In Canada: Dresser Mfg. Co., Ltd., 629 Adelaide St., W., Toronto, Ont.—Sales Offices: New York, Chicago, Houston, San Francisco.

VITRIFIED CLAY PIPE

RESISTS CORROSION

. . . *in one of world's largest sewers*

Kissena Corridor Park Sewer, part of New York City's new $10 million sewer project, is constructed of 18-inch Vitrified Clay Pipe. The main tunnels of this huge sewer are larger than the Holland Tunnel! They're designed to service 75,000 to 100,000 badly needed homes. Construction is by the City of New York, President of the Borough of Queens, Bureau of Engineering, Division of Sewer Construction.

NO FOREIGN MATERIAL IN CLAY PIPE

Vitrified Clay Pipe is not a compound or mixture of materials loosely held together by a chemically bonded agent. Clay in its natural stage is fused at high temperatures by means of an exclusive process called Vitrification. Clay Pipe is a permanent, *heat-bonded* material that will serve mankind for centuries without wearing out. Vitrification is the reason why Clay Pipe is acid-proof, rust-proof, does not crumble and won't disintegrate.

If you need specific information on a Clay Pipe question, write the details to the office nearest you.

NATIONAL CLAY PIPE MANUFACTURERS, INC.

100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
522 First National Bank Bldg., Atlanta 3, Ga.
703 Ninth and Hill Bldg., Los Angeles 15, Calif.
1105 Huntington Bank Bldg., Columbus 15, Ohio

C-249-1

Vitrified

CLAY

CLAY PIPE NEVER WEARS OUT!

PIPE

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE.—P. O. BOX 14, MEMPHIS 1, TENNESSEE

THE SILENT WATCHMAN

REPRESENTATIVES IN THE FOLLOWING CITIES:

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DETROIT, MICH. Box No. 1423
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SYRACUSE, N. Y. Box No. 681
BUTTE, MONTANA Box No. 383
GREENVILLE, S. C. Box No. 1074
TAMPA, FLORIDA Box No. 1642
RICHMOND, VA. Box No. 886
NEWARK, OHIO Box No. 623
FARGO, N. D. Box No. 1472
COLUMBIA, S. C. Box No. 472
DALLAS, TEXAS Box No. 1881
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WAUSAU, WIS. Box No. 682
SAN FRANCISCO, CAL. Box No. 1445
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SPOKANE, WASH. Box No. 906
MACON, GEORGIA Box No. 402
PROVIDENCE, R. I. Box No. 202

Complete Service for Elevated Water Tanks—

30 Years Experience

BE SAFE DON'T GAMBLE!

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress.

On completely re-conditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

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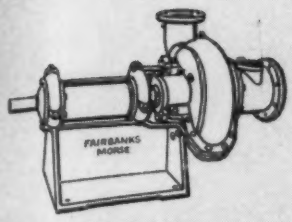
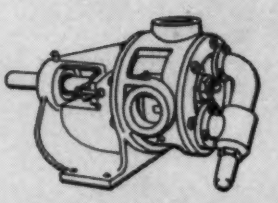
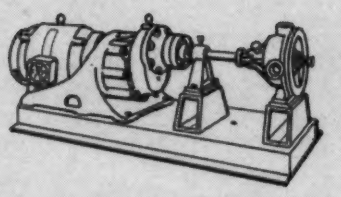
THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST



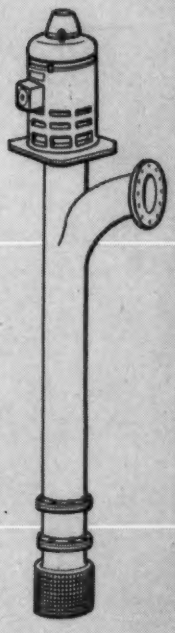
Paper Stock Pumps



Frame Constructed Rotary Pumps

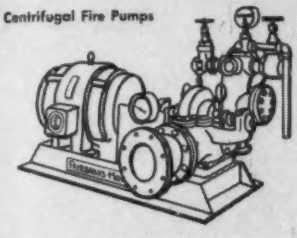


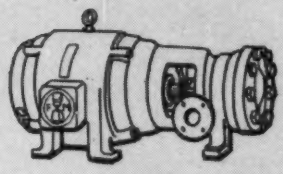
Rotary Pumps with Geared Head Motor Drive



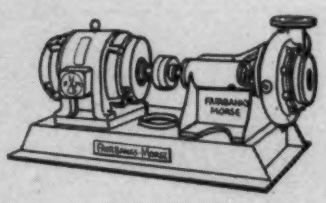
Vertical Propeller Pumps

Centrifugal Fire Pumps

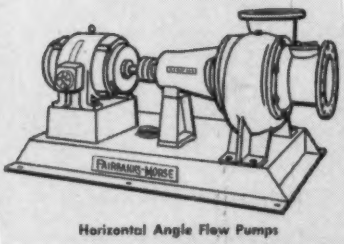




Two-Stage Builtogether Pumps



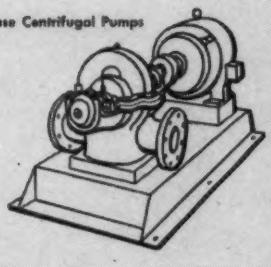
Horizontal Sewage and Trash Pumps

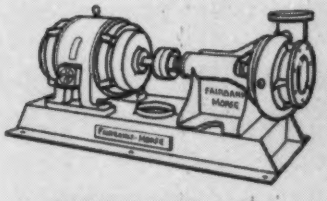


Horizontal Angle Flow Pumps

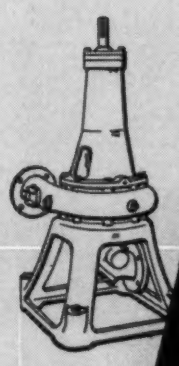
Vertical Close-Coupled Sewage and Trash Pumps

Split-Case Centrifugal Pumps



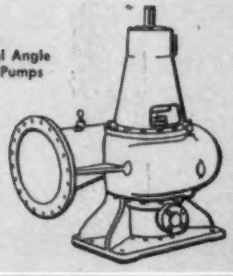


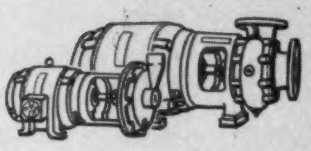
Base-Mounted Centrifugal Pumps



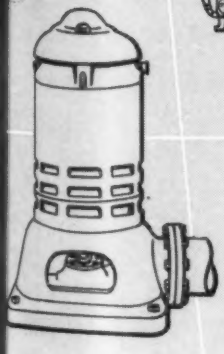
Vertical Sewage and Trash Pumps

Vertical Angle Flow Pumps

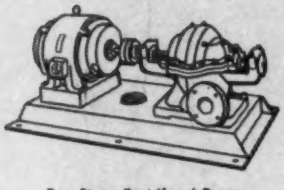




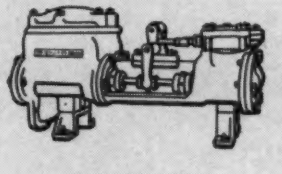
Builtogether Centrifugal Pumps



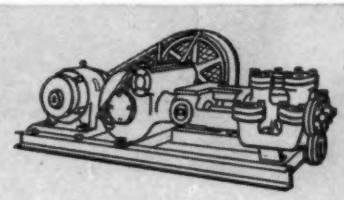
Deep Well Turbine Pumps



Two-Stage Centrifugal Pumps



Duplex Steam Pumps



8 Cover Side-Pot Duplex Power Pumps

for Pumps...

THAT DELIVER

plus performance
lasting dependability
unsurpassed economy

The Fairbanks-Morse Pump Dealer is your best bet for assistance in pump selection...for reliable service. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS
and STANDPIPES • FARM EQUIPMENT • MAGNETOS

Throw a wet blanket

HIGH COSTS!

The Sludge Blanket in the Permutit Precipitator acts as a filter...SAVES YOUR EXPENSIVE CHEMICALS!

The positively agitated uniform sludge filter in the Permutit Precipitator will save you up to 50% in space and 75% in time of treatment too!

The Permutit Precipitator offers you the newest and most efficient means of removing impurities from your water. It does this by precipitation, adsorption, settling, and upward filtration. Write for full details to the Permutit Company, Dept. W-2, 330 West 42nd Street, New York 18, N. Y., or to the Permutit Company of Canada, Ltd., Montreal.

SEE THESE BENEFITS:

- Short Detention Time
- Lowest Chemical Requirements
- Absence of Settling
- Adaptability to Variable Rates of Flow
- Low Turbidity
- Lengthened Filter Runs

FOR 35 YEARS
WATER CONDITIONING HEADQUARTERS

Permutit

"Have not purchased any other than Badger meters since 1924"

This is what the Service Manager of one city's Gas & Water Department wrote to another city:

"These meters have given such excellent service, and the repair cost is so low, that we have not purchased any other type of meter since 1924. It is a pleasure to recommend Badger Meters to you".

In over 5000 communities, waterworks men know that "It pays to BUY BADGER".

Every waterworks superintendent should have the NEW BADGER CHART No. 689 (Practical Plan for Meter Storage Rack). WRITE today for this chart...no charge.

BADGER METER MFG. CO., MILWAUKEE 10, WIS.

BRANCH OFFICES:
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You will find a Badger Meter size and type for every waterworks service. Shown here are Model SC-SOT (for warm climates), and Model A-SOT (for cold climates) . . . sizes 5/8" to 1 1/4" . . . other sizes up to 12". Write for complete information and prices.

BADGER Water METERS

ACCURACY • LOW-COST MAINTENANCE • DURABILITY • SENSITIVENESS

Announcing

THE BECKMAN MODEL "B" SPECTROPHOTOMETER

Note simplicity of controls. Also note the sloping panel that permits easy readability of scales from both sitting and standing positions.

ADVANCED FEATURES DESIGNED INTO THE MODEL "B" INCLUDE...

CONVENIENCE:

Direct reading wavelength scale . . . 320 to 1000 millimicrons . . . readings reproducible to great accuracy.

Direct reading transmission and absorbance (optical density) scales on large easily-read meter.

Continuously variable slits for smooth, precise settings.

4-Position sensitivity multiplier permits readings to be made on most advantageous portion of scale.

Four position cell carriage permits quick positioning of any of 4 cells by an external control.

ACCURACY:

Photometric accuracy to 0.5% transmission or 1% absorbance.

Negligible stray light—stray light effects completely eliminated between 360 and 1000 millimicrons . . . less than 1½% even at 320 millimicrons.

Resolution—permits less than 5 millimicron band width over most of spectral range.

VERSATILITY:

Liquid, solid and gaseous samples may be analyzed.

Monochromatic light beam is easily brought outside the instrument for long path measurements and special uses.

Accommodates large cells up to 50 m. m. path length in standard cell carrier.

Interchangeable photocells—red or blue-sensitive to utilize the high resolving power of the Model "B".

Easily-attached Model "B" accessories will be available for special types of measurements and for added convenience and accuracy. Write for details.

The new Model "B" Spectrophotometer is by far the outstanding routine instrument available. It provides advancements pioneered in the Beckman Quartz and Infrared Spectrophotometers but never before offered in a low priced instrument. These advantages are important because they combine simplicity, convenience and versatility without sacrificing accuracy and reliability.

The Model "B" has better ultraviolet performance . . . better resolution . . . better wavelength and photometric accuracy . . . and more freedom from stray light than any other instrument in its field.

A descriptive bulletin on the Beckman Model "B" Spectrophotometer will gladly be sent on request. Write today. *Beckman Instruments, National Technical Laboratories, South Pasadena 20, California.*

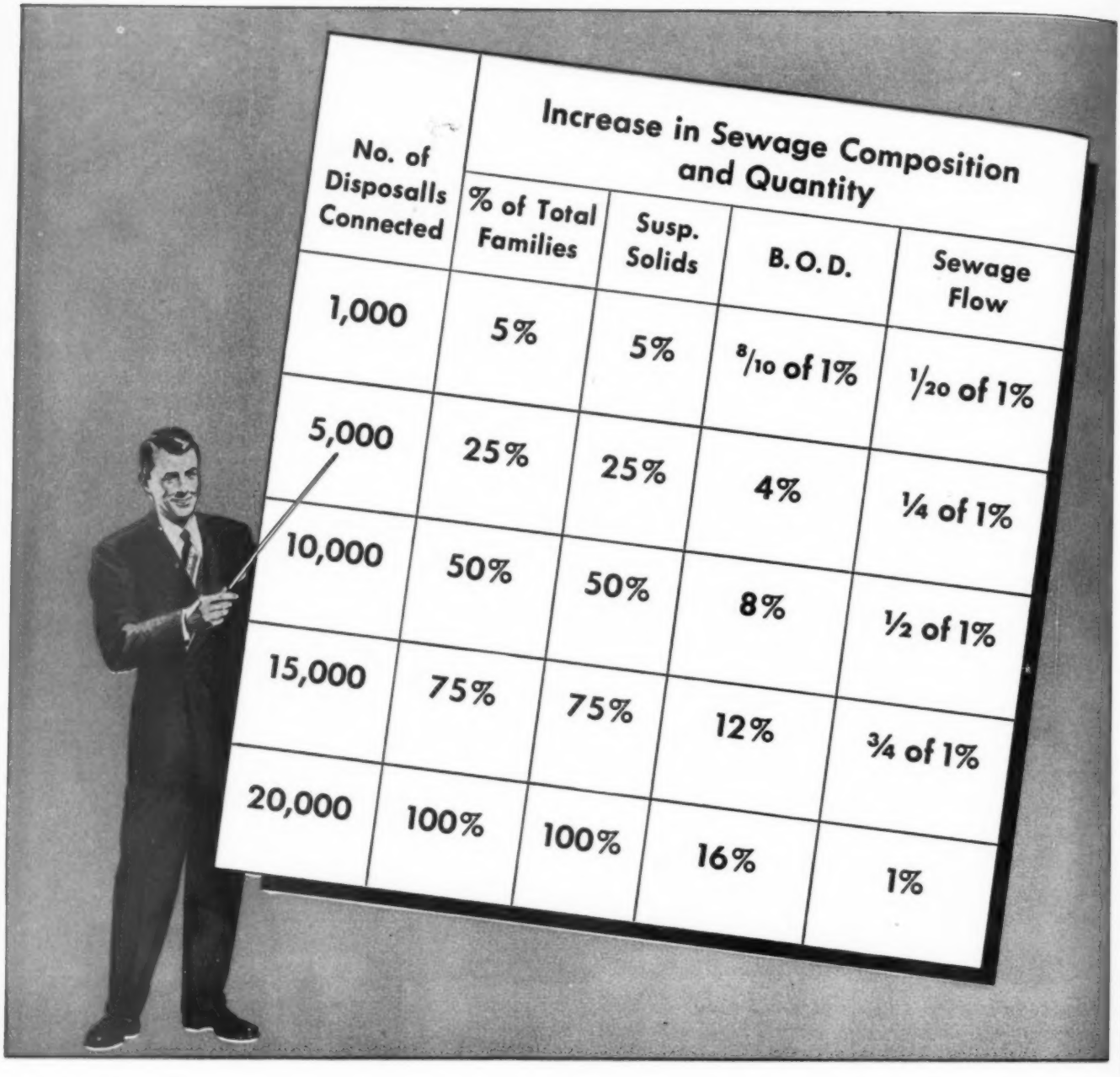
INSTRUMENTS CONTROL MODERN INDUSTRIES

pH Meters and Electrodes—Spectrophotometers—Radiation Meters—Special Analytical Instruments

Painted for U. S. Pipe & Foundry Co. by Paul Laune

U.S. PIPE

Improvements in the quality, and quality-controls, of U. S. Cast Iron Pipe are the fruits of research and development. They are also the rewards of patience. Months of pilot plant operation may elapse before a process-development is adopted as standard manufacturing procedure. Exhaustive tests in our headquarters research laboratory, one of the finest foundry laboratories, must precede a "go-ahead" to our plants. This is just another reason why you can lay U. S. Cast Iron Pipe with confidence. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey. Plants and Sales Offices Throughout U.S.A.**



We're glad you asked that question

HERE'S THE QUESTION most often asked by sanitation officials when first introduced to the General Electric Disposall*:

"Will this method of shredding food waste and flushing it into the sewer put too heavy a load on the sewer system and sewage treatment plant?"

Our answer to that important question has always been "No!" And it will be "No!" for many years to come.

When food wastes are ground, they are reduced to a far more uniform character than sewage solids themselves. Consequently, they flow even more readily through public sewer systems, they cause no stoppages, and they are readily treated at sewage treatment plants.

By applying the percentage lines shown above to your own city, you can see that in ten years the greatest number of Disposalls that might conceivably be installed would increase sewage flow gallonage less than ¼ of 1%.

The B.O.D. would be increased about 2.0% and suspended solids about 10%.

It is obvious that these increases could be adequately handled today without expanding the capacity of many plants. And remember, these increases are based on the assumption that one tenth of the homes in your community will have Disposalls within ten years. It takes many

years for an appliance as revolutionary as the Disposall to gain widespread usage. It will be ten years before even one home out of every ten has a Disposall.

The extra loading on the treatment plant caused by the Disposall method of garbage elimination will be but a "drop in the bucket!" for some years to come.

But we are glad you asked that question. It shows you are vitally interested in the great step forward which the Disposall method means to your community.

We only hope that you will continue to question—to examine closely—the merits of every food-waste shredder that bids for your acceptance.

For we can only answer for the General Electric Disposall, the product of years of careful development. And, because the Disposall is the pioneer in the field of scientific garbage elimination—and has proved itself in the laboratory and in countless homes—we can offer you our own strict list of specifications in the development of a dependable food-waste shredder.

We trust that these specifications—shown below—will be of value to you in judging all such appliances and in protecting the health, safety and economy of your community!

GENERAL ELECTRIC'S SPECIFICATIONS FOR ITS FOOD-WASTE SHREDDER— THE DISPOSALL

1. *The food-waste shredder should have a flow interlock that permits operation with cold water only, at a rate from 1.5 to 2.5 g.p.m.*

Experience has shown that only with cold water will greases become congealed within the unit. With congealed grease broken up into small particles, mixed with food waste and carried off through the drain, there is no tendency for greases to adhere to the walls of the pipe.

2. *The discharge from a food-waste shredder should always remain in a fluid state. The correct relationship between the amount of food waste and tap water should be maintained by controlled shredding.*

This permits the ready flow of effluent through traps, drain, or soil lines in a manner to prevent clogging.

3. *The food-waste shredder should shred food waste to a uniform size, to meet the following requirements: 100% shall pass a ½-inch screen. At least 90% shall pass a ¼-inch screen. Not more than 5% shall pass a #40 sieve.*

(Screens should be the United States standard, and weight should be taken on a dry basis.)

In other words, the particles of shredded food waste must be the correct size, to permit effective sewage clarification and sludge digestion at the treatment plant.

4. *The food-waste shredder should be self-scouring, with no fouling surfaces.*

This prevents objectionable odors; keeps the unit clean as a whistle.

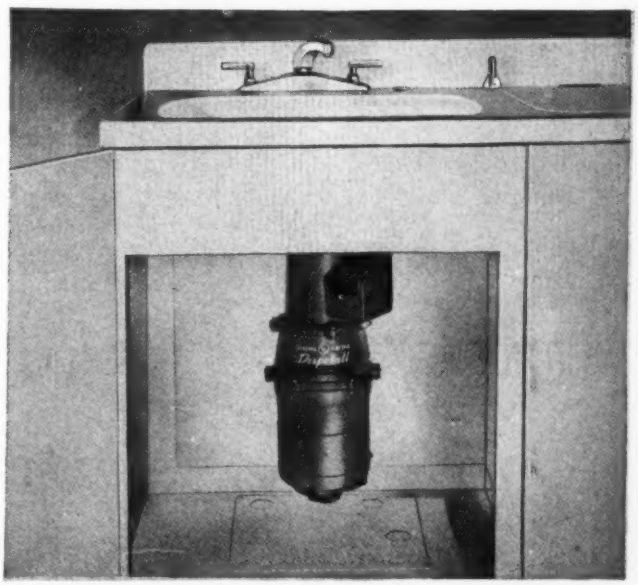
5. *The food-waste shredder should be free from electrical or mechanical hazards.*

To be completely safe, the shredding compartment should be inaccessible during operation.

6. *The food-waste shredder should be permanently connected to the drain, and should be free from any cross connection in accordance with the local plumbing code.*

This regulation eliminates any makeshift, homemade hookups, and permits the proper operation from sink to sewage treatment plant.

For further information about the Disposall method, simply write to Department WSW-492, General Electric Company, Bridgeport 2, Connecticut.



The General Electric Disposall is easily installed in almost any sink. Here it is shown installed in our electric sink. Food waste is scraped into drain opening, and safety cover is placed in position. The cold-water tap is then turned on, starting the Disposall operation. Food waste is shredded and flushed away automatically.

P. S. Thousands of Disposalls are operating successfully on private septic tank systems.

Disposall

*General Electric's registered trade-mark for its food-waste disposal appliance.

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GENERAL ELECTRIC

An Official Survey

Your first reaction to the statement on the opposite page may be—"remarkable if true." For it *is* remarkable but it is also true. And it is backed by the findings of an official survey sponsored by three water works associations.

This recently completed survey shows that of all the cast iron water mains, in sizes 6-inch and larger, ever laid by 25 cities, large and small, from Canada to Florida, *96% are still in service.*

The cities were selected, and the survey directed, by a Joint Committee representing the American Water Works Association, the New England Water Works Association, and the Institute of Water Supply Utilities. The achieved purpose was to ascertain the actual length of life of various water works facilities—mains, valves, hydrants, pumping equipment, etc.

The findings are reported in detail for each city in a book published by the American Water Works Association, which ought to be "must reading" for almost everyone connected with the water works industry. Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Avenue, Chicago 3, Illinois.

Mr. Q-Check says:
Alexandria, Virginia, laid its first cast iron pipe in 1852 and 99% of all sizes laid from that date is still in service.

P. S.: If you are interested primarily in the survey findings as they pertain to cast iron water mains send for our brochure "Survival and Retirement Experience with Cast Iron Water Mains."

CAST Q IRON

CAST IRON PIPE

Backs This Statement

96%

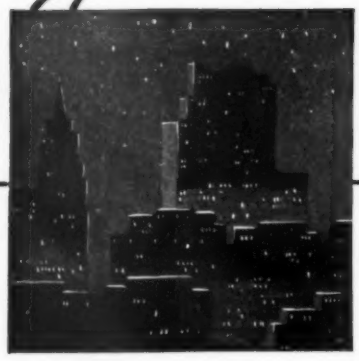
Still in Service

Alexandria, Virginia
Babylon, New York
Clinton, Iowa
Clyde, New York
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Huntington, W. Va.
Jamaica, New York
Merrick, New York
Norwich, New York
Ottawa, Ontario
Philadelphia, Pennsylvania
Portland, Maine
Rochester (Suburban), N. Y.
St. Mary's, Pennsylvania
St. Paul, Minnesota
Sag Harbor, New York
Scranton, Pennsylvania
Springfield, Massachusetts
Summit, New Jersey
Syracuse (Suburban), N. Y.
Utica, New York
West Palm Beach, Florida
Winnipeg, Manitoba

SERVES FOR CENTURIES

..by *Day*

or by



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199

WATER & SEWAGE WORKS

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A Gillette Publication

SEWAGE AND INDUSTRIAL WASTES IN 1948

by

F. W. MOHLMAN*

Director of Laboratories

SANITARY DISTRICT OF CHICAGO

*(*Chairman, Committee on Industrial Wastes—Federation of Sewage Works Assns.)*

THE FULL force of research and inquiry into all phases of sewage treatment and industrial waste disposal, so dormant through the war, reached a climax in 1948, to such a degree that one can specify two rather general trends—one, development of accelerated activated sludge treatment and of digestion processes, with slackening of similar studies of trickling filters, and two, intense interest in all branches of industrial waste disposal, by sanitarians, public officials and industrialists. Public authorities in the upper brackets have girded their loins for a new attack on industrial wastes and industrialists have realized that something must be done to abate the pollutional effects of their wastes.

As an outline of the trend of events, we may classify progress as follows:

Activated Sludge Acceleration:

Step Aeration; Kraus Procedure; Zigerli Asbestos Process; Okun-Pirnie Oxygen Process; Kessener Paddles; Precision Aerators; Impingement Aerators; Recirculation.

Digestion Progress:

Flash Heating; External Heating; Lagoons.

Trickling Filters:

Alternating; Recirculating; Covered; Nitrifying.

Industrial Wastes:

Biological Treatment; Lagoons; Antibiotics; Organic Chemicals; Oil Skimming; Magnesium Base for Sulfite Process; Canning Dairy.

The Author

Miscellaneous Problems:

Nitrogen Elimination; Fertilizer or Digestion; Dual Disposal.

These are the major technical problems challenging research. The year has also been intensely interesting in legislation, planning for enforcement of laws, international contacts, lay publicity and industrial cooperation.

Specific topics in each category might best be discussed in the given order, to obtain a picture of the trend of the year's progress.

ACTIVATED SLUDGE

The Bowery Bay plant was operated for seven months on the step aeration modification of activated-sludge treatment, whereby settled sewage was introduced in Passes B C and C D of a system of A B C D bays, the preceding passes being used only for sludge aeration. This procedure realizes a closer control of one of Mr. Gould's convictions that sludge age is the important factor in activated-sludge operation, and if this is controlled, the period may be shortened. The age (weight of sludge under aeration divided by incoming daily weight of sludge) should average approximately 3.5 days. With heavy loadings of 55 to 84 lb. of B.O.D. per 1,000 cu. ft. of aeration capacity, B.O.D. removals were 90 per cent and average air efficiency was 640 cu. ft. per lb. B.O.D. removed. Periods were in some cases as low as 35 minutes.

This work sets the stage for various efforts to shorten the detention period in activated sludge treatment. Kraus was interested more in bringing down the index of the Peoria sludge, which was so high (bulky sludge) that he could carry only a limited weight in the aeration tanks. By aerating supernatant liquor from the digestion tanks in one-fourth of his aeration tanks, building up high nitrates, and introducing this sludge with the normal returned activated sludge, he was able to reduce the sludge volume index greatly, to carry much more solid matter in the aeration tank, and to obtain a better effluent from three-fourths of the aeration tanks than he had ever been able to accomplish with all the tanks in service on straight aeration. He demonstrated the procedure thoroughly and it is now marketed by Pacific Flush Tank Co. Thus, again the advantages of a shortened period were demonstrated.

This possibility of shorter periods, reached in various ways, was first enunciated by Parsons and Wilson in

Testing Station for Zigerli Process—Zurich

England years ago. They indicated that the aeration period varies inversely with the concentration of mixed liquor solids, and if 4,000 ppm. can be carried, the period might be only about half of what it would be with 2,000 ppm. But who could carry 4,000 ppm. of a highly volatile sludge in aeration tanks without trouble? Therefore the desire has suddenly materialized in recent years to do something to lower the index, either by stabilizing sludge biologically or physically by addition of extraneous solids, and with the lowering of the index, to carry more solids and shorten the periods.

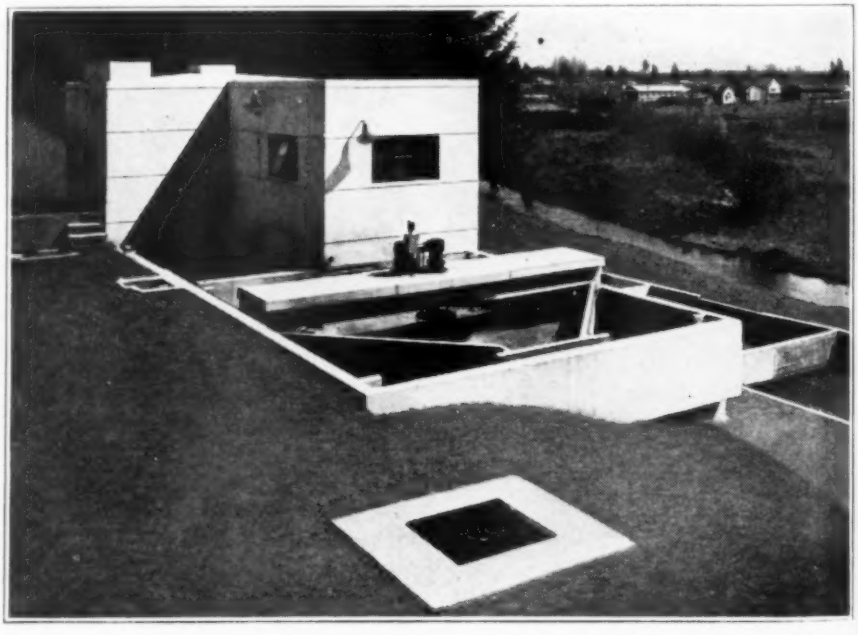
The same idea captured the fancy of a Swiss engineer, Paul Zigerli, more than ten years ago and he depended on addition of shredded asbestos to weight the sludge. Many other agents have been tried such as clay, silt, fly ash, etc., but it is possible that asbestos may have more specific properties for sludge weighting than such inert substances. When first proposed some ten years ago, up to 40 ppm. asbestos was added, an obviously uneconomic amount. For four or five years, however, the Swiss government at a testing station in Zurich (see accompanying photograph), has been studying the addititon of much lower amounts, averaging only 1 to 3 ppm. per day, after an initial dose of 10 to 40 ppm. This is within the realm of economy and appears to produce an effluent in one hour that takes four hours in an identical parallel aeration tank of standard design. I saw this plant in Zurich in August, but some data are still being studied to afford a direct comparison of results. Dr. Imhoff was also at the station and evinced considerable interest in the process. Drs. Wuhrmann and Corti of the Zurich Technisches Hochschule (E.T.H.) are in charge of the work. Dr. Wuhrmann is known to many Americans as an excellent biologist, as he spent some time in this country last year.

Then there is the oxygen process studied by Dan Okun at Harvard University under Prof. Fair and with the aegis of Malcolm Pirnie. At first, I thought the use of oxygen was the prime reason for the acceleration of this process to a one-hour period; a further study indicates that Okun does not claim this, but only that the oxygen maintains the sludge in operable condition, while the acceleration of the period is due to the large weight of solids carried in the system. Therefore the proof of this, as yet, laboratory process, depends upon larger scale work. The oxygen must be supplied cheaply, say only $5 per ton, but this is no impossibility. However, the design of tanks, using no settling tank, and maintaining concentrations from 5,000 to 10,000 ppm. in the system, offers a challenge to ingenuity in design. This is probably no greater a challenge than that which Ardern and Lockett faced when the principles of activated sludge were discovered on a laboratory scale, and therefore we may watch with considerable interest the next step in this radically different process of activated sludge treatment.

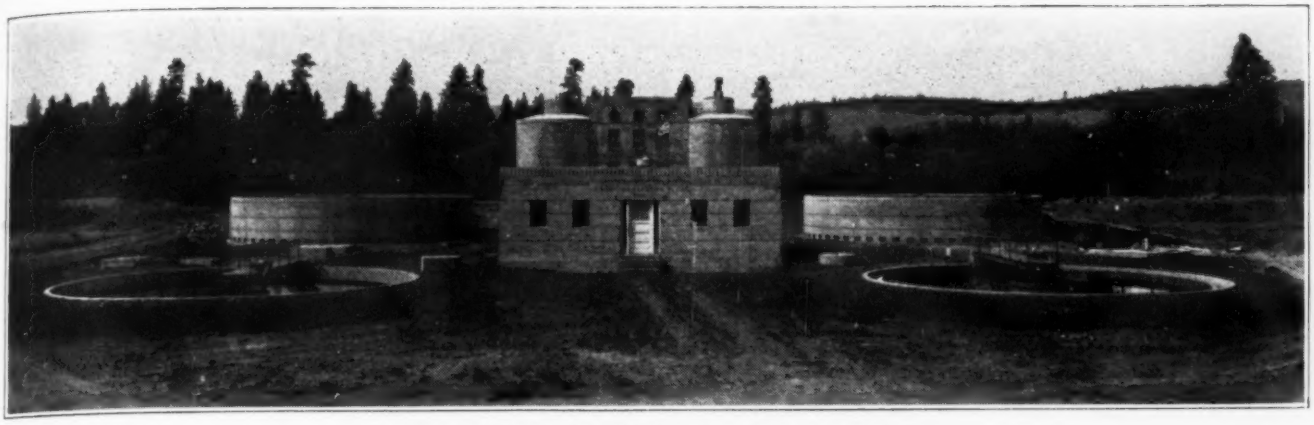
A small-scale process of aeration developed by Dr. Kessener at The Hague has been known for many years. Aeration and circulation were induced by a revolving brush at the surface of a tank of rather unusual design. Not many American designers took cognizance of this process as American variations of the process (Link-Belt, etc.) weren't especially attractive. But in the last two years, brushes have been discarded and stainless-steel fingers or triangles, some 18 in. long and 3 in. wide at the base, are attached to the revolving shaft to circulate the sewage and beat air into it. These improvements have been shown to introduce at least 40 per cent more air into the sewage than the old brush aerators, and for small plants the process looks good. The design of tank is not suitable for large plants as there is so much wasted capacity by filling in the side opposite the paddle, but this is not too important for small plants and may be modified for larger plants. This process is used widely in Holland, where Dr. Mom has succeeded Dr. Kessener as Director of the Gov't Institute at The Hague.

Effective Aeration Period

In connection with the attempts to carry more solids in aeration tanks and



Yeomans "Package" Aerifier Activated Sludge Plant at Pacific Lutheran College, Parkland, Wash.



Dorrco Two-Stage Biofiltration at Goldendale, Wash.

(Originally scheduled for 1942 but not completed until 1948 because of war shortages)

to hold low sludge blankets in final tanks, in recent years the per cent of sludge return has increased far above the one-time standard 20 per cent. Some plants approach 50 per cent while others hold the rate down to 15 per cent or less. When the aeration period is reported, this return sludge is included in the volume displaced, but for comparison of two plants, obviously more tankage is used with the 50 per cent than with the 15 per cent return. Therefore, I have been advocating use of a so-called "effective aeration period" based on the volume of raw sewage treated, and continuance of reporting percentage sludge return. If large amounts are returned, this amounts in effect to recirculation and advantage is gained by such recirculation. Therefore it is unfair to report aeration periods including returned sludge for a plant with high percentages, as compared with one with low percentages. I would like to see reports giving the effective aeration period, based only on the volume of raw sewage, after sedimentation.

Air Diffusion

Although various investigations are under way in attempts to shorten the aeration period, not much study is given to reduction of the air supply. We should consider air supply in relation to removal of B.O.D., rather than in cu. ft. per gallon, and on this basis air at 500 cu. ft. for removal of one lb. of B.O.D. is quite efficient, whereas 800 to 1200 cu. ft. are frequently used, not always inefficiently but sometimes because of the presence of inhibitory industrial wastes. Such data, however, give a much better measure of air efficiency than any other parameter; therefore it is of interest to see how efforts succeed in obtaining low air requirements.

I visited the Paris activated sludge plant at Acheres (shown in an accompanying figure) this summer to satisfy a question as to why air was distributed only through open pipes 1½ in. in diameter and extending an unknown distance below the surface. I thought this would satisfy a number of requirements, namely low pressure and freedom from diffuser problems, but I wondered how such coarse bubbles could compete with the finer bubbles known to be produced with diffuser plates, and so striven for, provided the pressure isn't too great. I found that the plant was shut down, but I saw the tubes extended down 3 metres, thus causing loss of much of the advantage of low pressure. The scanty record of B.O.D. records indicated a very weak sewage and possibly more than 1,200 cu. ft. of air per lb. of B.O.D. removed, which indicated a rather inefficient use of air and a design not attractive to American engineers in view of our almost universal use of air diffusers, in spite of pressure losses and slow clogging.

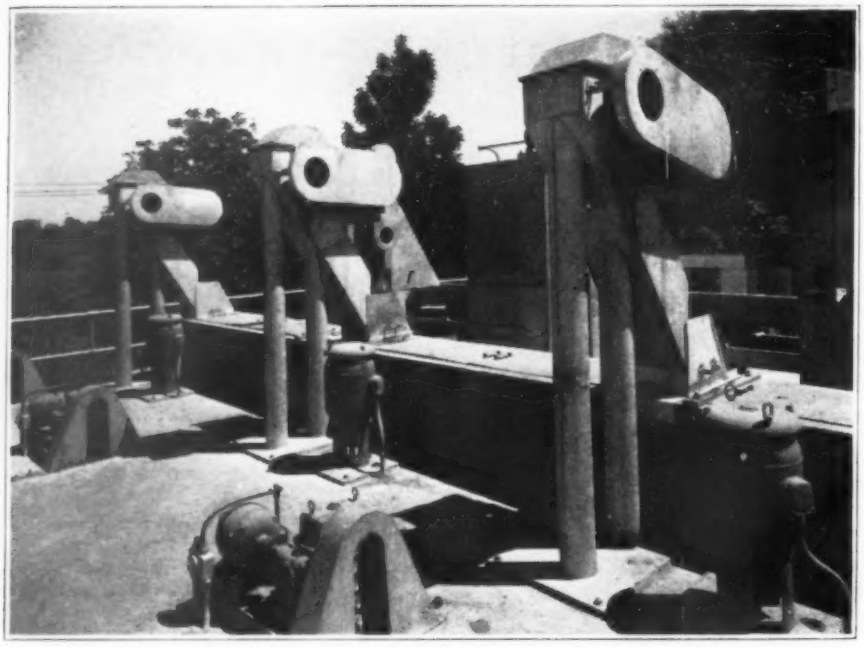
Paris sewage is still treated on sewage farms, which seemed prosperous and thriving, but funds are not available for the activated sludge plant operation.

Diffusers are under study and test in the U. S. at many activated sludge plants, and two developments should be mentioned. The Precision Diffuser of the Chicago Pump Co. is a perforated stainless steel corrugated tube wrapped with a Saran cord. Air is diffused through the space between the cords and the size of bubbles can be controlled somewhat by the tension and spacing of the cords. This tube has been used for a year or so and if cleaning is feasible when it becomes clogged, the tube shows considerable promise.

The Walker Process Equipment Co. has studied and installed a dual

Activated Sludge Plant at Paris

(Aeration is through 1½-in. tubes three meters deep)



Walker Process Equipment Screening and Grit Separators at Decatur, Ill.
(Additions and improvements to old plants are as important as new plants in many cases)

water-air diffuser arrangement "Diffusair," which consists of a large air orifice, non-clogging, and a current of water directed against a baffle, around which the air breaks up into very fine bubbles. The air is truly atomized, thus realizing one long-sought factor, but the cost of installation and operation of the air-water system depends upon the pressure, volume of water per volume of air, and spacing of the impingement nozzles. The American Well Works has a similar device called a jet aerator. The device was originally developed at the Dow Co. at Midland, Mich., but the high water pressures and volumes required much reduction to be considered competitive for sewage aeration.

SLUDGE DIGESTION

There is always something new in sludge digestion. Now we hear of high-rate digestion, up to 5 or 6 lb. per cu. ft. of tank capacity per month, and use of unheated tanks or lagoons for the gasified, concentrated, odorless sludge; sludge is heated in various ways; circulation is coming into more general practice; supernatant liquor disposal is not so much of a problem; and dual-fuel gas engines afford more satisfactory and cheaper operation than other types of stand-by units.

Rankin shows about 50 per cent reduction in volatile matter at a loading of 4 lb. dry solids per cu. ft. per month. Greeley suggests rates of 5 or 5.5 lb. to give 50 per cent volatile matter in the digested sludge. This high rate requires mixing of tank contents and no separation of supernatant liquor, but appears feasible and gives sludge which can safely be discharged to heated storage or lagoons or to vacuum filters.

Van Kleeck has reviewed sludge digestion at length and claims that lagoons following partial digestion afford an economical method of sludge treatment at plant sites with ample and isolated land areas.

Sludge Heating

The heating of sludge digestion tanks has long had variations from the preponderant hot-water coils, among other methods being exterior steam heating, with or without double coils; direct steam heating; and recently, direct flame external heating. This has been reported by Keefer using the Kemp heater at Baltimore, and this year Tark described the Selas heater to be used at Philadelphia. With up to 90 per cent heat exchange possibility, this seems to be an ideal method for flash heating and most economical. Such heating is in rather general use in steel mills for pickle liquor and for other purposes where products of combustion do not injure the heated liquid.

Kunsch reports results at Urbana, using the PFT external gas heater. The gas-heated coils did not cake and a heat efficiency of about 75 per cent was maintained. Very little maintenance was necessary after pilot light difficulties were stopped. Temperature was 95° F. and loading 2.75 lb. per cu. ft. per month. Gas production was high, at 1.13 cu. ft. per capita, or 12.5 cu. ft. per lb. volatile solids added. Supernatant liquor was very poor as only one digester was available.

Lagoons

Van Kleeck cautions against the use of lagoons for undigested sludge, but such lagoons have been in use in Indianapolis and Chicago (see photograph) for some years. They haven't been without odor, but isolation has localized odors and avoided too much complaint. Pearse and an A.P.H.A. Committee have reported in detail on present-day lagoons, which still seem to be prevalent in the United States. Intelligent operation is essential in developing methane fermentation and starting digestion.

Disposal of Liquid Sludge

Backmeyer, at Marion, Ind., describes his procedure for disposing of liquid sludge. Two trucks are in use, the sludge was digested, containing only

Industrial Wastes in the United States

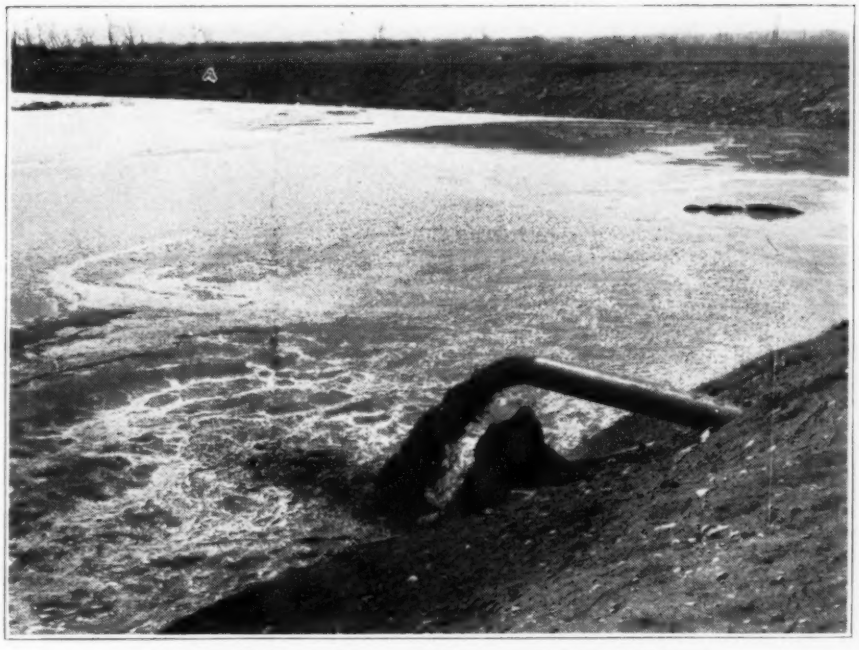
2.84 per cent solids, and some 7,500 gallons were used per acre. Dry sludge contained 2.7 per cent nitrogen and 3.7 per cent P_2O_5. Range of delivery was five miles. The net cost was $4.25 per dry ton removed.

This appears rather promising for small plants. British comment suggests that distribution by pipe-line has been proved preferable in England, but that this method of sludge disposal is well thought of over there. It was in use in a number of army camps during the War.

Fertilizer Production

Chicago, Milwaukee and Houston continue to turn out dried, readily salable, activated sludge. In fact, the latter plant is being greatly enlarged to include all sludge as compared with only a few thousand tons per year at present.

The ferric chloride problem is still the "Old Man of the Sea" for sludge filtration. It seems that chemical companies consider they are doing a great favor to sewage works to supply ferric chloride at 4 cents per lb., whereas two years ago the price was under 2 cents. Chlorine has, of course, been diverted to other more lucrative channels and is used grudgingly for ferric chloride manufacture, but it seems as though the tide is about ready to turn and the burden may be lifted. Other coagulants are not much good for activated sludge, although ferric sulphate is used at Minneapolis for settled sludge, and by-product aluminum chloride is considered at Buffalo. On the whole, the situation is quite confused, largely because of the scarcity of rubber-lined tank cars.



Pumping Sludge to Lagoon at Sanitary District of Chicago

TRICKLING FILTERS

The study of high-rate trickling filters still goes on, with design suggestions by Velz, Thomas, Greeley, and Rankin. Greeley sent a paper on trickling filters to the Summer Conference of the British Institute on Sewage Purification. Included in the paper was a curve of results to be expected with loadings up to 16,000 lb. per acre ft. per day, comparing straight loading with recirculated loading and also with the National Research Committee curve. Up to 3,000 lb. per acre ft., the curves are quite similar, showing efficiencies from 78 to 66 per cent, with 1,000 to 3,000 lb. loadings. Recirculation has definite advantages up to 10,000 lb. loading.

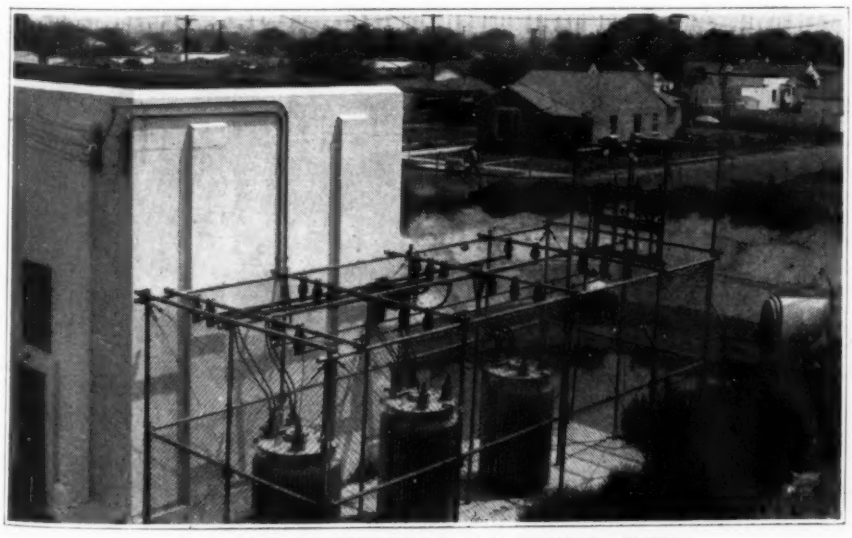
Velz postulates that filters follow a monomonecular law in that the rate of removal of B.O.D. per unit of depth is proportional to the remaining concentration of removable B.O.D. Observed removals checked computed results. The removable fraction, however, must be determined experimentally for any particular filter.

Alternating filters are discussed under "Industrial Wastes." Covered filters have not been investigated in the U. S. Their cost hardly seems warranted by any demonstrated high rates in England.

The inability of high rate filters to produce nitrates at rates over 2,000 lb. B.O.D. per acre ft. was noted by Mohlman. Differences in B.O.D. removals have been discussed by Hardenbergh, who suggests that some additional tests are needed to explain variations.

Much research has been spent on trickling filters in England, the outcome of which seems to be possibilities of increasing the load, mainly by recirculation or alternation. The English filters, however, have always run at very low loadings, say 200 to 300 lb. B.O.D. removed per acre foot, so even a doubled or tripled rate still comes within the range of a low-rate filter. Also some nitrification is a *sine qua non* of English filters, and this can still be obtained at these rates. Therefore, the life of many old filters may be extended by new methods of increasing loadings.

One interesting investigation, at Halifax by Lumb, dealt with the periodicity of dosing. As a result of small scale and full-scale investigations, it was concluded that a rest of 4 to 9 minutes is preferable to continuous dosing. As a further proof it was cited that slow rotary distributors show less tendency to pond and need much less forking-over than do beds



Storm Drain Pumping Station at Long Beach, Calif.
(Shown are transformer and accumulation reservoir—Inside two 500 hp. and three 300 hp. G.E. motor driven pumps.)

Pista Aerator for the Production of Ferric Hydroxide

equipped with rapidly-rotating distributors. However, all such studies were within the range of low-rate loadings, namely from 163 to 453 lb. per acre ft. per day.

In investigations of a true high-rate filter at loadings of more than 4,000 lb. B.O.D. per acre foot, Kehr and Ruchhoft of the U. S. Public Health Service found no difference between two filters, one dosed with "rain-drop" application and the other with four straight-arm distributors.

Thus there seems to be some question about the necessity, or rather the advantage, of continuous dosing, one of the talking-points for increased loadings of high-rate filters.

INDUSTRIAL WASTES

The growing importance of industrial waste disposal is emphasized by the dual names of some of the new association members of the Federation of Sewage Works Associations. Sewage and industrial wastes associations are now designated for Kentucky-Tennessee, Ohio, Pennsylvania, Virginia and West Virginia, and the programs of all associations usually carry as many papers on industrial wastes as they do on sewage or stream pollution. All technical journals feature articles on industrial wastes and are receiving increasing numbers of papers on waste disposal.

Many types of industries have organized committees or technical groups for study of waste disposal. Such committees are the Manufacturing Chemists' Association, American Iron and Steel Institute, American Petroleum Institute, American Electroplaters' Society, National Canners Assn., National Council for Stream Improvement of the Pulp, Paper and Paperboard Industries, and groups of tanners, packinghouse experts, textile industry, milk and cheese industry and brewers' institute.

The map herewith shows how these industrial wastes are located over the United States. Eastern and New England States vie with Midwestern States for concentration of industries; West Virginia has been called the Ruhr district of the U. S.; paper and pulp dominates the northern states; oil and citrus fruits the southern states; a new organic chemical empire has sprung up in Texas; and new antibiotics plants dot the eastern half of the country.

Antibiotics and Organic Chemicals

The last industry is of especial interest, because of the variety of antibiotics, their resistance to bacterial attack, and the rapid changes in their waste products. Penicillin is the first of the group. There are plants in New Jersey, New York, Michigan, Indiana, Illinois, and other states which have varying problems of disposal. Formaldehyde caused trouble at Syracuse; amyl alcohol at most plants; and the high B.O.D. at all plants. The substrate for penicillin is largely corn steep water from starch plants, plus nutrient salts. Wastes also contain formaldehyde or amyl acetate, which cause trouble unless removed by aeration. Some wastes contain spent activated carbon. Disposal of the mold hyphae should not be down the sewer.

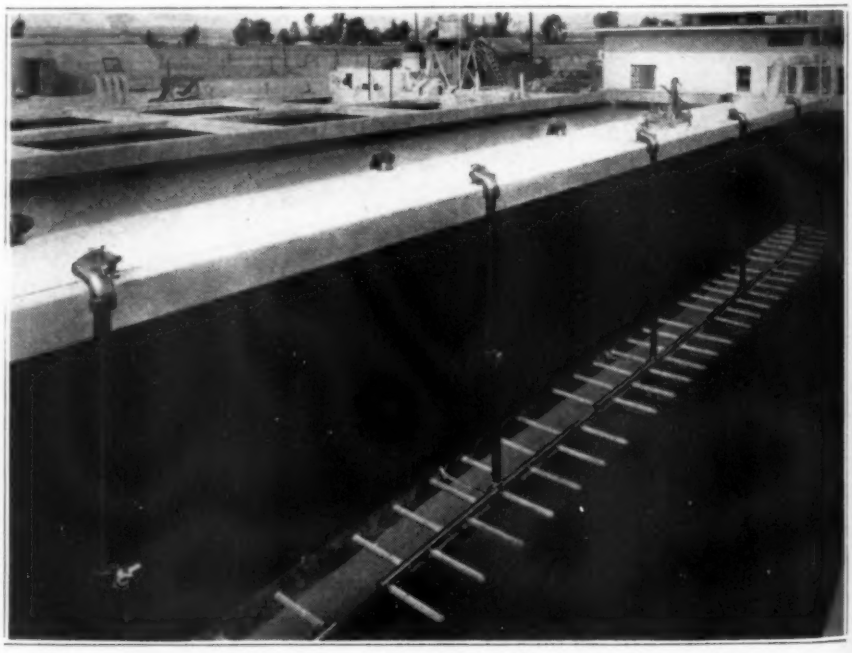
Streptomycin wastes may contain a resistant dye; aureomycin organic chemicals; and new antibiotics are announced every few months.

For most of these wastes dilution, aeration, filtration and recirculation seem to be effective, but in removal of dyes large amounts of chlorine may be necessary and such wastes are resistant to biological oxidation Penicillin wastes have a B.O.D. near 20,000 ppm.; streptomycin around 6,000; and others are in this elevated range. The need for boosting the production was so great during the war that not much attention was paid to wastes but now many plants find it necessary to treat the wastes and they find it difficult to decide how it shall be done, unless research shows the way.

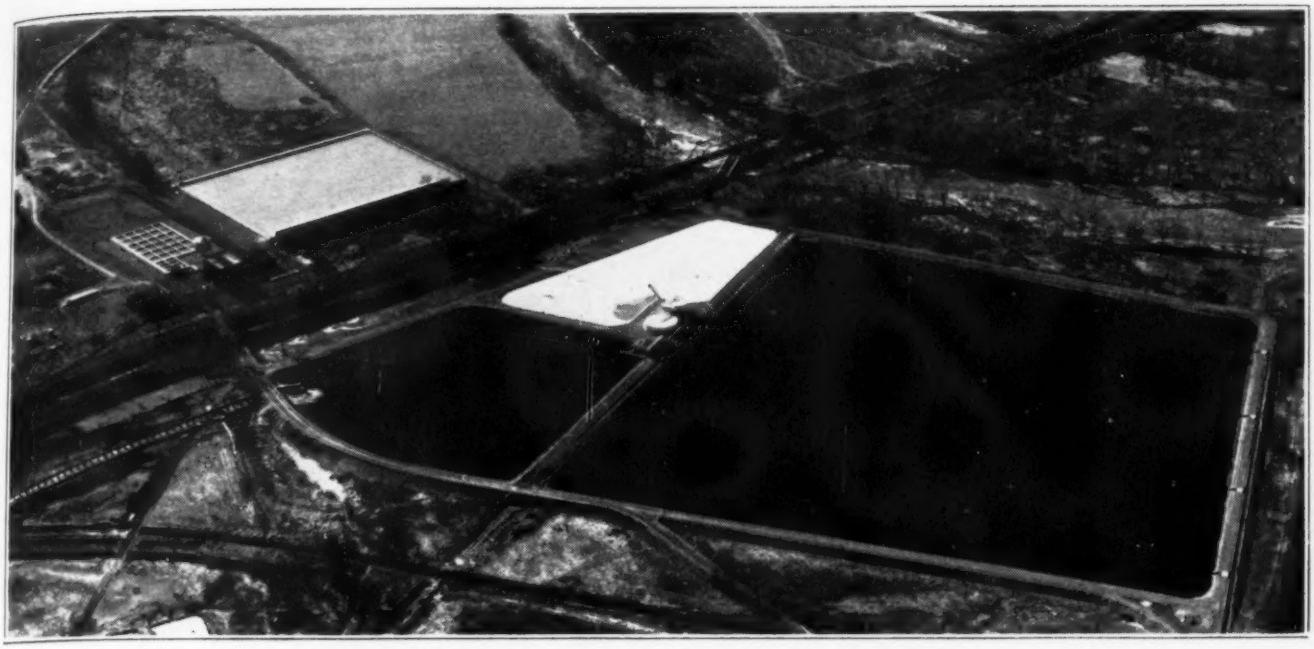
Organic chemicals include phthalic anhydride, formaldehyde, synthetic phenol, furfural, methyl alcohol, butadiene, azo-dyes, detergents and pharmaceutical residues, all wastes being difficult to treat and requiring processes subject to research.

Other Industrial Wastes

The Manufacturing Chemists of America has a very active committee on waste disposal, whose Chairman, Dr. R. W. Hess, discussed their problems at the Detroit meeting of the Sewage Works Federation. This committee is very active and holds frequent meetings at which the disposal of certain types of their wastes is discussed in detail. Also, at the F.S.W.A. meeting in Detroit, Dr. King of the Calco Chemical Division of the American Cyanamid Company, discussed the half-million dollar mixing and storage plant of his company, (see photograph). Various other



Chicago Pump Co. Swing Diffusers Installed at Oildale, Calif.—2 mgd. Capacity



Treatment Works, Calco Chemical Division, American Cyanamid Co.

wastes were discussed at the Purdue 4th Industrial Waste Conference.

Neutralization of acids interests du Pont. Disposal of alkali sludge is a problem for Solvay at Syracuse. Formaldehyde waste disposal interests Celanese Co., Spencer, and others. Phthalic anhydride wastes are present at Cyanamid, Allied, and Monsanto. Quaker Oats has to consider effect of wastes from furfural. West Virginia struggles with butadiene and alcohol wastes. Corn Products has a new plant at Corpus Christi. The growth of new plants in Texas is astounding.

Baltimore County Sewer Project
(33-in. "Transite" Sewer Pipe)

For treatment of wastes for which ferric hydroxide coagulant is specific, a novel device called the Pista Aerator (see photograph) has been developed in Switzerland and promoted by Bendel. This chamber has a revolving propeller which circulates the liquid, dissolves iron from iron turnings dumped in the bottom of the tank, oxidizes the iron with vortex-captured air, and discharges the flocculant to the remaining volume of waste before sedimentation. The process looks good in Switzerland, with iron turnings at about $4 per ton, but looks dubious in this country, where the price is $30 to $35. However, the device is ingenious and looks preferable to the apparatus described in the *AWWA Journal* by Leaf for use at Alamosa, Colo.

Iron and Steel Industry

Slow progress is noted in attack on the pickling liquor problem. *Chemical Industries* tells of the Wheatland Steel Co. process in which ferric hydroxide is precipitated and filtered off, after addition of 1,100 lb. chlorine; then zinc sulphate and chloride are crystallized out by evaporation. The products are hoped to be sold for pigments, lithapone, and wood preservatives. This seems a complex, expensive process, especially if zinc is not present in pickle wastes.

Hopes for installation of the high-temperature pickling process are still held, with recovery of ferrous sulphate (monohydrate) and re-use of acid. Some plants have this under serious consideration but the installation costs and problems in handling such hot solutions and drying the crystals still require investigation.

Of course, lime precipitation can still be required, and is in use, but this represents no progress in the past several decades. It is too bad some attractive recovery process has not appeared. Swindin reports such a process in England. Direct flame heating of pickle liquors (by Submerged Combustion Co.) appears feasible.

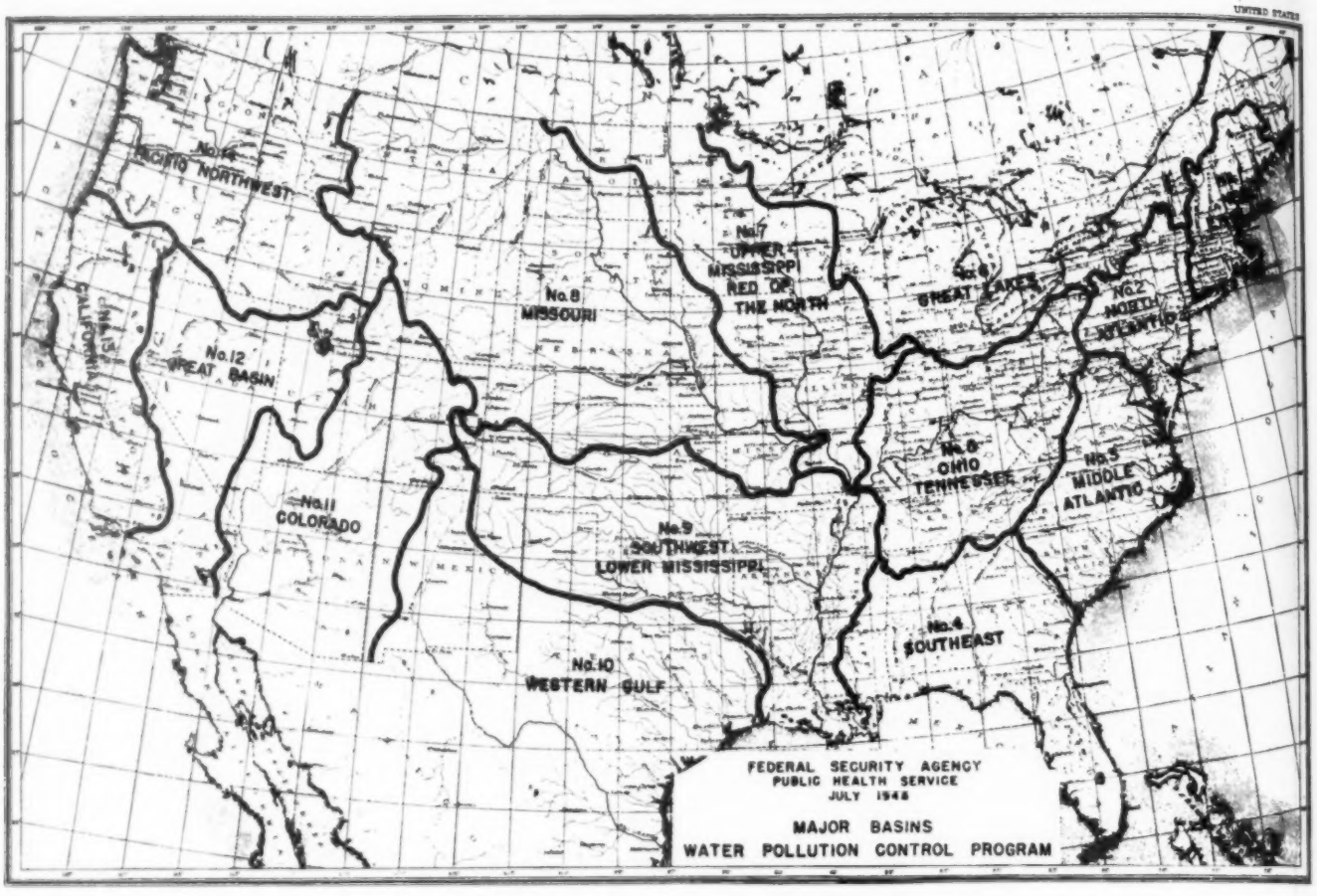
Pulp and Paper

Reports of the investigations of the National Council for Stream Improvement of the Pulp and Paper Industry would fill many books and some plants are being installed, but not many. De-inking wastes can be clarified and such treatment is reported at Johnsonburg in Pennsylvania.

Rudolfs has studied clean-up of white water by save-alls and flotation chemicals. Gehm is not sold on trickling filters for alkaline process pulp and paper mills, although Southgate recommended such treatment in England.

Tyler has worked on filters for sulfite liquors and has hopes for river aeration to alleviate sulfite pulp pollution. Lawrance controls flow of the Androscoggin River in Maine, to cope with pulp wastes.

Fodder yeast or alcohol from sulfite wastes do not solve the pollution problem, neither does the Howard Process. A ray of hope, however, is appearing in the sulfite problem, in the substitution of magnesium for calcium as the sulfite base. Chemicals can be regenerated, as in the sulfate process, and the only apparent deterrent is the first cost of new digesters, recovery apparatus, etc. A new plant using magnesium has been started by the



Major Basins—Water Pollution Control Program—U.S.P.H.S.—1948

Weyerhaeuser Co. at Longview, Wash., and results will be watched with interest.

Petroleum Refining

Oil skimmers of the API type are being installed on a large scale, particularly by three refineries, Standard of Indiana, Sinclair, and Cities Service in the Calumet Region of Indiana. These new skimming basins are estimated to cost approximately $5,000,000, with the Standard basin the largest in the world. This improvement, described by Carpenter and Mathews, was undertaken by the Indiana industries following a lawsuit in the U. S. Supreme Court, the action having been brought by the State of Illinois in order to stop the pollution of the southern end of Lake Michigan. The case never came to trial, but resulted in cooperation of all Calumet industries under supervision of a Master appointed by the Supreme Court, to install treatment devices for industrial wastes and to treat all human sewage in the Gary, Hammond, and East Chicago plants.

An A.P.I. skimming tank at the Toledo plant of the Standard Oil Co. of Ohio has been described by Ross. It cost $750,000.

Hart wrote a series of twenty articles in *Petroleum Processing*, which were reprinted in a book in 1948. He says that trickling filters for cleaning up separator effluents are in the developmental stage, but their practicability has been established.

Canning

Siebert gives a complete description of the use of lagoons and sodium nitrate for cannery wastes at Hanover, Penna. This plant operates almost the entire year, canning some 1,150,000 cases per year. Waste waters average from 200,000 to 400,000 gal. per day. In 1947, some 22 tons of nitrate and 6 tons of soda ash were used. The nitrate averaged 60 lb. per thousand cases packed.

Solids should first be screened out, then settling provided and finally addition of nitrate and lagooning. The ponds have a period of about 10 days at maximum rate.

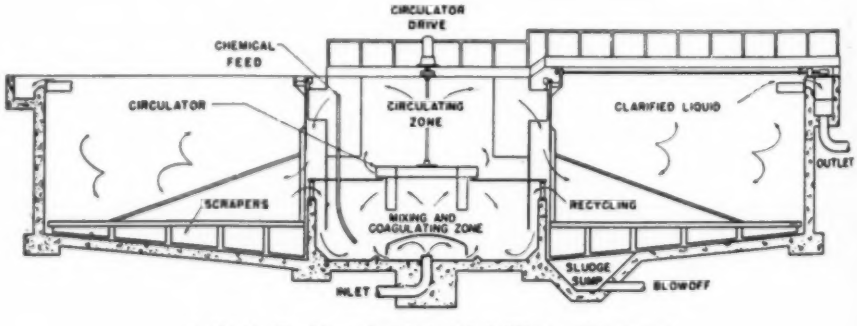
Canning wastes in Indiana were discussed at the Purdue Conference. Irrigation fields were discussed by Bolton and were claimed to be a success in Iowa.

Dairy and Packing House Wastes

Dairy waste treatment was discussed by Eldridge at the Detroit meeting. A panel at the Central States meeting in Milwaukee discussed losses and treatment. McKee of the Kraft Co. considered trickling filters to be too expensive.

A special study of the filter at Ovid, Mich., is being made by a task force of the dairy industry.

The Oscar Mayer plant at Madison has abandoned use of zinc chloride



Infilco's Cyclator for Industrial Waste Treatment

Heart of the Swiss Alps—Mts. Eiger, Monch, and Jungfrau

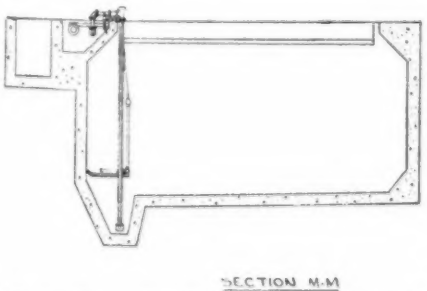
(Climax of the 10th International Limnological Congress in Zurich was a trip up the cog-road to the Jungfraujoch—a memorable mountain trip.)

and is now using lime alone. Morrell at Sioux Falls has installed salvage screens and catch basins, also has increased evaporators, but increased kill in 1948 keeps losses up.

Vibrating screens are receiving favorable attention in the meat industry for salvaging fat. Slaughterhouse wastes have had special study by the Pennsylvania State Dept. of Health in 1948.

Plating, Brewery, and Atomic Wastes

Several plants have been installed for plating wastes, using chlorine to destroy cyanides. Wise describes practice in Connecticut. Washburn studied toxicity of plating wastes to fish in Michigan. Wuhrmann made similar studies in Switzerland. Cyanide is very toxic, less than 1.0 ppm. being fatal, but combination with ammonium or sodium salts greatly reduces toxicity. Plating wastes were discussed at the Purdue Conference.



Chicago Pump Co. Hydraulic Grit Removal System

Brewery residues are being recovered, particularly yeast. Distillery slops are now almost universally dried and sold.

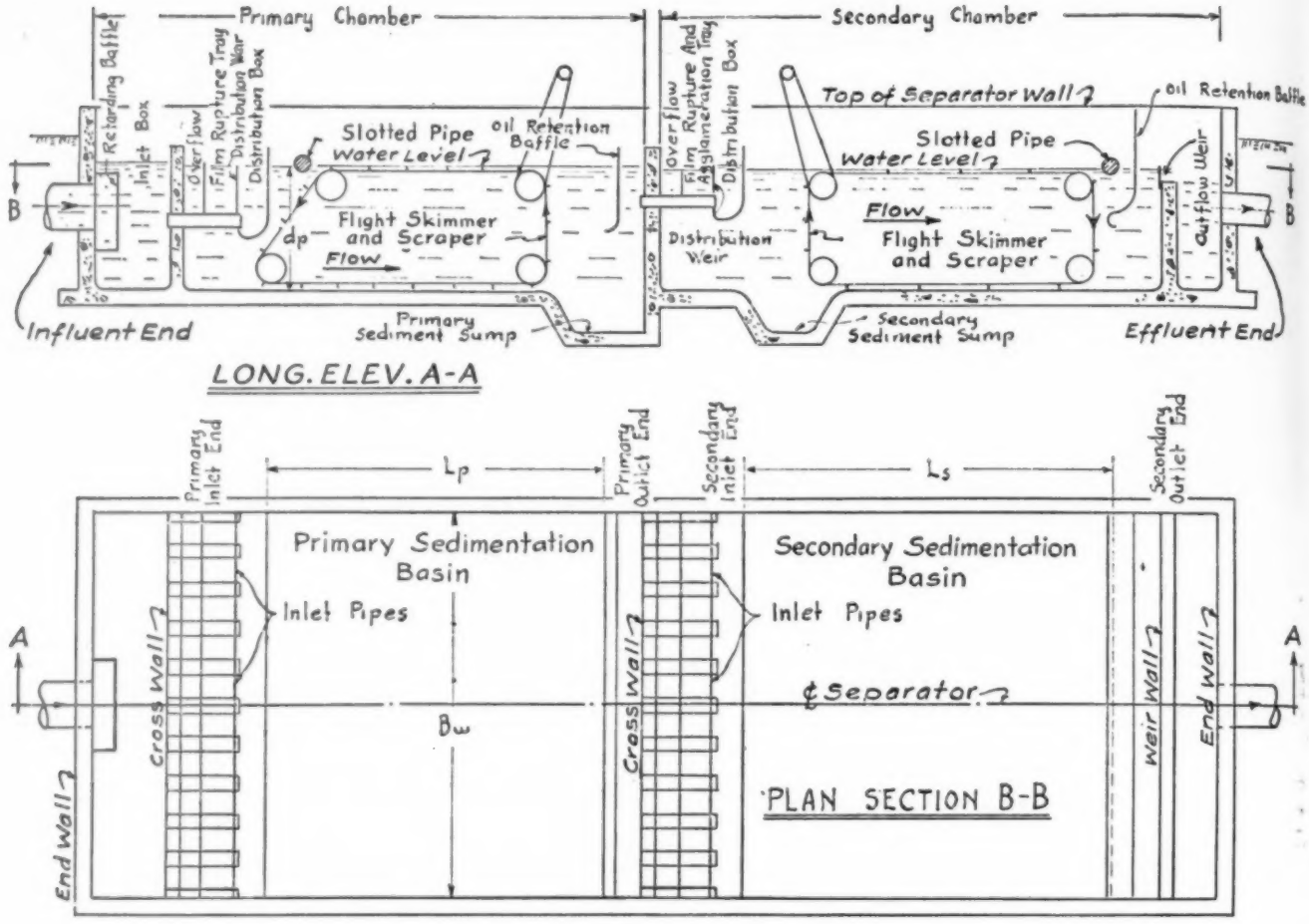
Wastes from atomic energy centers (Hanford, Oak Ridge, Argonne, etc.) are under very thorough study by the AEC, and a few general facts have been discussed concerning hazards and methods adopted to lessen or eliminate such hazards, but no data have been published and the subject is still "top secret". An indication of more general publicity in 1949 is given by announcement of a special meeting between AEC experts and water and sewage experts in Washington in January.

REGULATION AND PUBLIC CONTROL

After years of effort, the Spence-Barkley-Taft bills finally were passed by both houses as Public Law 845 in June, 1948, which is now being organized by the Public Health Service and Federal Works Agency. The U.S.P.H.S. has divided the country into fourteen river basins which will cooperate with State authorities. Projects will be allowed grants for preparation of plans, and loans for any one project are permitted up to $250,000. No grants are allowed industries, but loans may be negotiated. There is to be an advisory board of ten persons, six of whom are to be appointed by the President.

When orders issued by the States are not obeyed, the Federal Government can step in, if requested by the State, and institute legal action. Some $4,000,000 is granted for a five-year period for a laboratory center and for research at Cincinnati, much of it on disposal of industrial wastes. This provision irks those in control of the Izaak Walton League; Mr. Reid thinks that it only postpones the day when industry must treat its wastes.

Those to be in charge of regional offices are being sought by the U.S.P.H.S., also those to teach and train personnel at the Cincinnati Stream Pollution Laboratory. Funds have not been appropriated to implement any of the provisions of the law, but such action is expected early in 1949.



General Arrangement of A.P.I. Separator

This marks a new era in American procedure and indicates the deep public interest in elimination of pollution. Several popular articles appeared in the *Saturday Evening Post, Collier's,* and *Sports Afield.*

Also in 1948 the Ohio River Compact was signed and inaugurated in Cincinnati. (Ed. Note: See article by K. S. Watson in the January issue of *Water & Sewage Works.*) This includes eight signatory states—Indiana, West Virginia, Ohio, New York, Illinois, Kentucky, Pennsylvania and Virginia, and others may follow. The funds are appropriated annually by the states, one-half in proportion to the population within the District and the other half in proportion to the land area. This seems to be a difficult setup for financial continuity of the Compact. However, a director is being sought. The Compact is to work directly with the States and the Federal Government in enforcing measures to abate pollution of the Ohio River and tributaries.

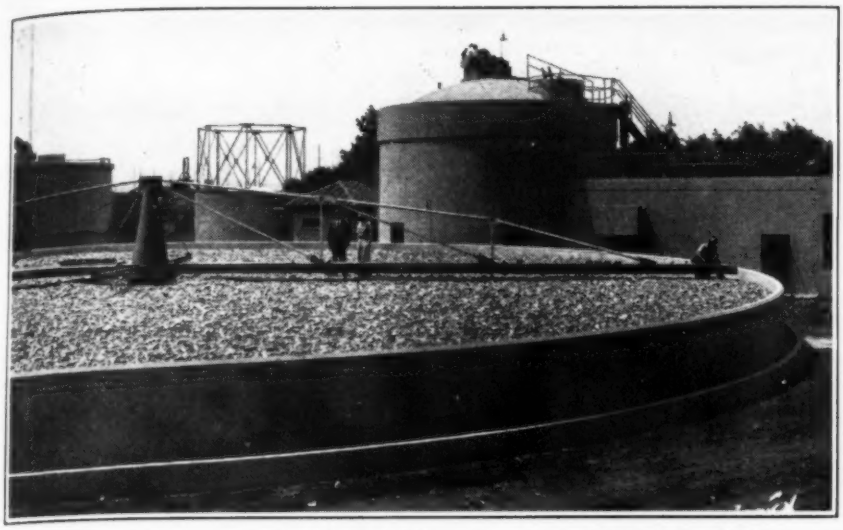
The International Joint Commission on Pollution of Boundary Waters came to life in 1948 by reporting on studies near Detroit, and holding hearings with industries considered to pollute the boundary waters in this vicinity. Certain standards were promulgated and industries asked to regulate their wastes to meet these standards. Some of these standards might be considered idealistic, but possibly this international board should set a rather high standard. At any rate, their work now continues in the Buffalo-Niagara Falls area. The U.S.P.H.S. does the work for the U. S., Ontario engineers and chemists for Canada, and the Stream Pollution Commissions and State Boards of Health of Michigan and New York are also partners in the investigations.

The Buffalo River industrial pollution is to be reduced 50 per cent and a project to provide lake water for flushing purposes is being pushed by the Buffalo Sewer Authority. This seems to be a very helpful move, which was promoted largely by Dr. Symons, Consultant to the Authority.

The Ostertag Bill is due for a re-

R. B. Carter Co. 176 ft. Reaction Type Rotary Distributors Convert Old Type to Modern Filters at Worcester, Mass.

(Another old plant modernized to handle industrial wastes)



Combined Sewage and Industrial Waste Treatment at Palo Alto, Calif.
(Additions of Dorrco Vacuator, Clarifier, Rotary Distributor, and Digester to a primary plant produced a bio-filtration plant for 30,000 persons and 70,000 population equivalent of canning waste.)

hearing in the New York Legislature in 1949. This Bill combines the stream pollution control functions of the State Departments of Health and of Conservation into a new regulatory authority for control of pollution.

The New England States have a Water Control Authority, also the Pittsburgh District, "Incodel", the Potomac River Basin, and others.

INTERNATIONAL MEETING

An international meeting was held in Zurich, Switzerland, in August, 1948, attended by representatives from about 20 nationalities. This was the Tenth Congress of the International Limnological Society. Papers in English, French, German and Italian dealt with lake biology and chemistry, sewage pollution, industrial wastes, fish studies, and analytical procedures. In particular, the nitrogen factor in pollution was considered. This was very much of interest as comprising the last major problem of sewage disposal in lakes or ponded streams. The Madison lakes have had this nitrogen problem, with subsequent algae growths, for some years, and the Sanitary District of Chicago is approaching the time when serious consideration must be given to the 43 tons per day of nitrogen still present in effluents. Although 90 per cent of the B.O.D. may be removed, only about 51 per cent of the nitrogen can be removed by present methods of sewage treatment, within any reasonable cost.

Suggestions of fish culture were made at the Zurich meeting, but it is questionable whether this is the answer. However, aside from technical matters, the meeting was delightful. There was constant reference to the harmonious international relations (the Russians weren't there). Also delightful trips, several all-day, were arranged to the lakes and mountains of Switzerland. The climax was a Congress trip up the cog-road to the Jungfraujoch, a memorable mountain trip. The Swiss proved themselves masters in operating a sightseeing as well as a technical convention.

NEW IDEAS IN 1948

One new proposal in 1948 was made by Rawn: that sludge from the Portland plant be discharged back into the Columbia River, inasmuch as it would add very little to the B.O.D. of the effluent and would save money. However, B.O.D. is not the important factor in this problem, which is not a question of oxygen balance at all, but rather the desire to get the sewage out of the Willamette River and to avoid too much bacterial pollution of the Columbia.

Another development has been the frequent discussion of home garbage grinders—are they a menace to sewage treatment? The question seems somewhat academic, because of the uncertainty as to how far the movement will extend, considering the cost of the equipment.

Cloroben has been studied more carefully, by Eliassen, in 1948, and he feels it may have certain uses for repressing sulfide production. It was reported helpful at Oklahoma City.

George Russell reported on rehabilitation of the Belleville, Ill., plant and proper evaluation of the tributary industrial wastes.

Equipment News

Mention has already been made, above, of new equipment for air diffusion and for sludge digestion tank heating. There were a few other items that might be considered as new equipment in the year of 1948. Among these are the following:

The Chicago Pump Co. introduced its new hydraulic grit removal system.

Infilco, Inc. developed a new apparatus known as the "Cyclator," essentially an upflow clarifier for the treatment of industrial wastes.

Ralph B. Carter Co. developed a new sewage ejector as a solution to small capacity pumping problems.

Gorman-Rupp Co. developed a Self-Priming Sewage Pump, of the non-clog, open impeller type for pumping raw sewage, trade wastes, desludging septic tanks, sumps and all similar duties. It is especially adaptable for out-lying lift stations and for pumping sludge and supernatant liquor.

Flexible Sewer-Rod Equip. Co. brought out a new power sewer cleaner.

In addition there were a number of new improvements in motors, pumps, measuring devices, and chemical feed equipment.

One of the Year's Largest Projects—Lambert's Point, Va. (Hampton Roads)

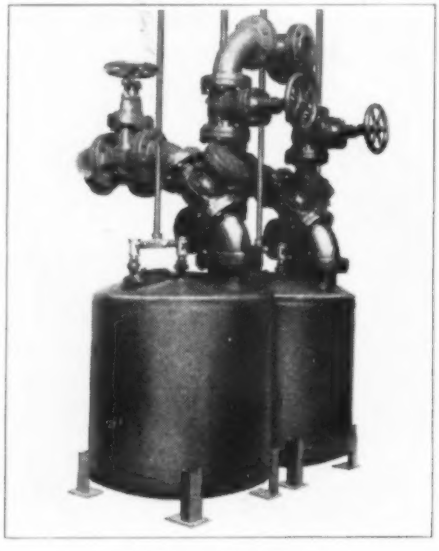
One of America's Newer Plants—Loveland, Colo.

Conclusion

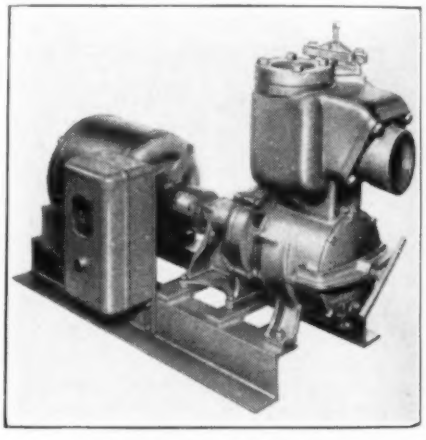
On the whole, 1948 was a very interesting year in fostering new ideas in sewage treatment, as well as a year of progress in plant construction. A primary treatment plant was under construction for Boston; new work was underway in Philadelphia; Tampa started plans for treatment; Cincinnati took first steps in a twenty-five million dollar program of sewers and treatment; Detroit considered steps to be taken to reduce pollution above the water intake; Chicago completed Battery C at the Southwest Works, the final activated-sludge plant in the program, for West Side Imhoff effluent; Portland considered treatment in the near future; San Francisco went ahead with the North Point project; the Los Angeles activated-sludge plant was under construction; also treatment for East Bay cities.

The intense interest of industries in disposal of wastes should result in considerable construction in the near future, especially now that interstate compacts, the U.S.P.H.S. and the International Joint Commission expect some concrete evidence of waste treatment by industry.

Flexible Sewer-Rod Equip. Power Sewer Cleaner



R. B. Carter Co. Sewage Ejector



Gorman-Rupp Self-Priming Sewage Pump

"DICK" BECKETT DIES AFTER AUTO ACCIDENT

R. C. (Dick) Beckett, Chief Sanitary Engineer, Delaware State Board of Health, died in mid-December, in Wilmington, Del., a few days after an auto accident in which his car struck an abutment on the du Pont Highway.

"Dick" Beckett, whose wit and humor as well as his professional abilities were known well throughout the sanitary engineering profession, had been sanitary engineer of Delaware for twenty-five years. Beckett was also Executive Secretary of INCODEL, the Interstate Commission on the Delaware River Basin. He was fifty-five years old at the time of his death.

A graduate of Penn State College in 1916, with a B.Sc. in Sanitary Engineering, "Dick" Beckett also attended the University of Nancy, France, in 1919. Prior to becoming State Sanitary Engineer for Delaware, he was Asst. Engr. in the Penna. State Dept. of Health in 1920-21, and Asst. San. Engr., W. Va. State Dept. of Health, 1921-24.

During his tenure of service to Delaware, he served on many commissions and committees within his state and on interstate work as attested by his association with INCODEL.

Mr. Beckett was the author of numerous technical articles and was a member of the A.P.H.A., the Fed. Sew. Wks. Assns., and the A.W. W.A., for which he had served as a Chairman of the Four States Section.

MAKING A WASTE SURVEY FOR A LARGE INDUSTRY*

by
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Supervisor
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THE ABATEMENT of stream pollution and the cleaning up of streams is a nationwide movement as definite as inflation is at the moment. This movement is "a way of life" or a certain part in the evolution of our civilization. Formerly wastes were thrown in the gutter and this practice brought the realization that the installation of sewers to carry waste into the most convenient water course would greatly improve local conditions. Discharge of wastes to streams, however, coupled with continuing national expansion and a new set of esthetic values resulted in the realization that the discharge of untreated and unlimited quantities of sewage and waste interfered with many desirable uses of streams and, in some cases, produced conditions which were definitely objectionable. The entire country is now clamoring for cleaner streams and, moreover, is doing something about it through the enactment of laws which require that waste be given necessary treatment before discharge by cities and industries. A further evidence of the public's opinion is the increasing frequency with which bond issues which appropriate money for sewage treatment receive favorable consideration from the voters.

It is the purpose of this article to discuss the problems which industry must solve in abating stream pollution. However, I would not be doing the subject justice if I failed to reiterate the fact that money invested in equipment for the treatment of waste represents capital on which an income must be earned, and that the cost of operating such equipment becomes a part of the cost of producing goods and is, therefore, reflected in the selling price.

The First Step

The objective of this paper is to outline what may be considered an effective method for "Making a Waste Survey for a Large Industry." The first step in undertaking a stream pollution abatement program is for the overall company management to decide upon a policy which the plants will be expected to follow in stream pollution abatement work. Since progressive companies are law-abiding and wish to live in peace and friendship with their neighbors such a policy will generally state that the company will abate all pollution which causes nuisance or results in conditions failing to conform to established standards or criteria of water quality. It is not enough to decide on such a policy; it is also necessary to publicize the policy within the company so that there will be no doubt concerning management's intention, and so that everyone concerned will become familiar with the policy.

The Author

In order to obtain effective administration of a company policy on stream pollution control, the person placed in charge of the pollution abatement program should be someone high enough in the organization of the company to make decisions and have a voice in the expenditure of funds. Too often a company realizes that something must be done to reduce stream pollution and then hires someone or assigns one of the members of the technical staff to make a survey and prepare recommendations concerning the things which should be done in order to reduce waste to a satisfactory level. Such a report is often received by management with astonishment when they realize how much needs to be done and the amount of money involved in carrying out the program. The reason for this is that nobody in management had been following the progress of the study and as a result the report finds management wholly unprepared for the information which it contains.

Reporting to the person in management who has been assigned to follow the stream pollution abatement program should be a competent person to serve as a specialist on industrial waste disposal. Such a specialist should be one who has considerable knowledge of the company's technology and methods and has had previous experience in the solution of industrial waste disposal problems. Training or experience in sanitary engineering, plant production work, research or laboratory work will also prove to be helpful. The industrial waste disposal specialist may require a small staff of engineers in carrying out his duties. The size of such a staff will, of course, depend upon the size of the company, the number of plants operated and the complexity of the manufacturing processes used.

Two Principal Goals

In order for an industry to effectively control stream pollution, two principal goals should be set. One is the avoidance of new sources of pollution through the construction and operation of new plants or increases at existing locations. The other goal is the accomplishment of necessary improvement in waste at existing locations. In order to reach these goals, pollution control must be considered at every step from research through design and plant operation.

If a new product is developed through research, careful consideration should be given to the wastes which will be produced. The necessary methods for controlling the quantity of waste should be developed at the same time that the new process is being developed. This may involve either methods for eliminating waste, recovering waste, some treatment process, or a combination of two or more of these procedures. In some cases alternate methods of manufacture will produce different amounts of waste. In such a case it might very well be that the type and amount of waste would be a deciding factor in selecting the final process.

*A paper presented before the Fourth Industrial Waste Conference, Purdue University, and here published by permission.

From the design standpoint careful consideration must be given to waste disposal in order that new plants and plant expansion will include the necessary facilities for the proper disposal of waste. This applies particularly when the location for a new plant is under consideration since the degree of treatment will be greatly influenced by local conditions. In fact, this may very well be one of the deciding factors in selecting the location of a new plant or in deciding whether it is practicable to enlarge an existing plant. The design for the waste collecting system will be influenced by the kind and amount of treatment required. Since careful consideration of waste disposal is necessary throughout the design phase, the design engineer should work in close cooperation with the company specialist on industrial waste disposal.

In order to guard against new sources of waste and to accomplish satisfactory improvements at established plants, one of the most important factors in the pollution abatement program is the waste organization at the individual plant. Therefore, details concerning the organization and execution of a pollution abatement program for a single plant will be outlined. It is not unusual to find that in the construction of the older plants adequate facilities were not provided to dispose of waste in a manner which will meet the standards which have been established within the last few years. It is, therefore, necessary to obtain a large amount of data concerning the quantity of waste, the individual sources which contribute waste and the probable amount of reduction which will be required. Such information can only be obtained by making a very careful survey of each plant and carrying out a program designed to reduce the amount of waste discharged.

Where such a program is just being started the first emphasis will be on general housekeeping and improvements in efficiency followed by process changes or the installation of equipment which will either eliminate waste or recover materials. The next step in such a program will be the installation of equipment for treating the waste to bring about any further reductions which are necessary. The degree of treatment should be based on the standards which have been established by the state stream pollution control agency, or in the absence of standards, on preventing conditions which would cause nuisance or damage.

Methods of Attack—in General

In seeking to accomplish the objectives just named a general method of attack which has been used successfully is outlined below. The items to follow are not necessarily listed in the order of their importance.

1. A competent person should be selected to supervise the work. His qualifications should be similar to those of the person assigned to serve as a specialist on industrial waste disposal for the company although his knowledge of company processes need only include the ones in use at the particular plant where the work is to be done. Depending upon the size of the plant this person may or may not have other duties.

2. For a large plant or for one where the waste disposal problem is complex, additional assistance may be required in carrying out the pollution abatement program. Such assistance may be furnished either by selecting or employing persons to work under the man in charge of the program or by making available to him the assistance of the engineering and technical groups.

3. The necessary funds should be provided so that the person in charge of the program not only can carry on his routine duties but also can undertake experimental work in which small scale units are used to evaluate promising methods for the recovery or treatment of waste.

4. The person or persons engaged in this type of work should be given access to company records which will show the quantities of raw materials used, the cost of these materials, the amount of product manufactured, production costs, sales prices, unit cost of utilities, and such other information as may be needed to evaluate the problem.

5. The person responsible for supervising the plant program should call on the company waste specialist for guidance in planning, organizing and carrying out the work. As the study progresses, care should be taken to keep the company specialist informed concerning all phases of the work so that he will be able to render better service when his assistance is needed. It is also important that he have complete information for the individual company plants so that he can keep overall company management informed concerning the status of this type of work.

Things to Watch and Records of Progress

6. Once started on the work of making a plant survey, one of the first things which should be done is an analysis of the material records to determine the total quantity of each material used in process and the quantity of each material consumed per pound of production. Such analysis when continued on a month-by-month basis provides an excellent means for determining whether progress is being made in reducing the amount of waste. This information when plotted graphically serves to illustrate to plant management progress which is being made in stream pollution abatement.

7. A study of the plant material records is incomplete unless material balances are made for each of the major materials received at the plant. Such a balance is designed to account for all of the materials received in a given period of time, and it requires that data be developed to show how much material was shipped out with the finished product, the amount which reached the sewer at each stage in the process, the amount hauled to the dump, and the amount lost to the atmosphere. Such material balances are considered to be of prime importance since they clearly indicate the points at which material is lost and show the amounts involved. They, therefore, show the parts of the process which should receive early attention and the places where there is good possibility that waste may be eliminated or where it may have to be collected.

8. A system of records should be set up so that complete information is readily available concerning the status of the program. These records should include information developed from plant material records, information concerning the rate of production, the quantity of each material which is discharged to the receiving stream, the volume and analysis of the waste stream, and flow and analysis of the receiving waters. There are a number of other items which probably belong with those named above. Items which should be included depend upon the particular plant and the local conditions.

Analytical and Experimental Work

9. The necessary facilities should be provided for doing experimental work and running analyses of the plant wastes. Much of the equipment required for doing this will be found in plant control laboratories but specialized equipment of one sort or another will be required from time to time. The determinations which should be made in carrying out an analysis of plant waste will be governed by materials which are known

to be present and by the standards which must be met.

10. Facilities for obtaining samples of the plant wastes should be provided. Samples should be collected from the main plant sewer, from individual sewers and from the stream into which wastes are discharged. The type of sampling equipment required will vary with the conditions encountered. Sometimes spot samples will suffice while at other times composite samples should be collected. The total number of samples which will need to be taken will also depend upon the number of outlets which discharge to the receiving stream and the probable variations in concentration as result of batch ditching of waste.

11. Analyses of waste must be accompanied by measurement of volume. For this reason it is necessary to obtain data not only on the concentration but also on average, maximum and minimum flow of waste in the main sewers and from individual operations. Complete data should also be obtained on any operations which are intermittent or which produce waste which is not discharged on a continuous basis.

Stream Surveys—Progress Reports —Publicity

12. Surveys should be made of the receiving stream to determine the effect of the waste upon the receiving waters. Information collected, of course, depends upon the type and quantity of waste being discharged but will generally include stream flow, dissolved oxygen, biochemical oxygen demand, pH, alkalinity or acidity, temperature, insoluble solids, total dissolved solids, compounds producing tastes and odors, and sometimes toxicity tests or analyses to determine the concentration of particular chemicals which might produce a toxic effect if present in sufficient quantity. Samples should be taken from a location above the discharge point for the plant wastes and for a considerable distance downstream. In taking samples downstream from the point of discharge, an effort should be made to determine the zone of maximum oxygen depletion and if possible the zone where stream recovery is practically complete. This is often complicated by the fact that there are other effluents from cities and industries discharging into the same section of the stream.

13. Inasmuch as the reductions which are made in the quantity of waste are of interest to those responsible for the operation of the plant and are often the result of work which has been done by persons located in the technical, operating or engineering departments, the results obtained should be publicized by the person who supervises the stream pollution abatement program. In addition to publicizing the results, efforts should be made to keep the subject of stream pollution abatement before the operating and technical groups at all times. This can be accomplished in several ways; namely:

(a) Frequent letters and reports should be submitted, pointing out conditions that need correcting and outlining ideas and suggestions for reducing waste. Also, periodic reports should be made on the progress of the stream pollution abatement program. These letters and reports serve to keep before the operating organization the need for waste reduction and are a record showing progress in waste control and that the company has been diligent in its efforts to control pollution.

(b) Meetings should be held for discussing problems connected with industrial waste disposal. Such meetings should be attended by representatives of management, the technical, operating and engineering groups. These meetings can be called to present recent developments, to carry on an educational campaign and to develop suggestions and ideas which will be helpful in bringing about further reduction in the quantity of waste.

(c) The showing of motion pictures such as "Clean Waters" and the use of posters will prove beneficial in carrying out a campaign to publicize the need for pollution abatement. The purpose of such publicity is to make the entire personnel of a plant conscious of the need for reducing waste to a minimum and to bring them to the realization that it is of vital interest to all of them that this be done.

Work Programming

14. Periodically a work program should be prepared. The items included in this program will, of course, depend upon the greatest need at that particular time. In general, however, at the beginning of a stream pollution abatement program it should be directed toward making reductions in the amount of objectionable wastes which will require the least change in process or that can be accomplished for the smallest investment.

15. Along with the work being done to reduce waste by employing recovery methods a study should be undertaken to determine applicable methods of treatment to certain wastes. At first these studies should be concerned with those wastes which obviously cannot be recovered or with instances where it appears that the required expenditure for the necessary recovery equipment is enough to warrant a comparison with the cost of treatment. It will often be found that a given amount of money when spent for recovery equipment will earn some return whereas the same investment in equipment for waste treatment to accomplish the same reduction will show no return.

In practically every case it will be necessary for industry to provide equipment for the treatment of sanitary sewage and equipment for removing settleable solids and floating matter from industrial waste. Where this is indicated, attention to its accomplishment should be given during the early stages of the stream pollution abatement program.

Another factor which should be considered carefully at this time is the possibility of collecting the sanitary sewage and a part or all of the industrial waste for discharge into a municipal system. Where this can be done without causing damage to the sewerage system and without upsetting the municipal treatment plant, it may prove to be the most economical course to follow. In some cases before a final decision can be reached on this point, very accurate information concerning the quality and quantity of industrial waste will be found necessary. In those cases where satisfactory arrangements can be made with a municipality some form of pre-treatment will often be necessary in order to prevent damage to the municipal system. The cost of doing this will have to be compared with the cost of improving the quality of the waste sufficiently to discharge it directly to the receiving stream.

Expert Advice and Exchange of Information

16. In the course of a program, such as that outlined herein, there will be occasions when assistance will be needed on problems which are new to company personnel or which call for knowledge and experience outside of their normal field of work. In these instances the services of a capable private consultant should be employed. Such an arrangement can be readily employed to advantage and there should be no hesitation in calling on consultants when there is a need for their special abilities.

17. This item, although mentioned rather late in the discussion, is considered to be of prime importance. The person supervising the waste program at a particular plant should become acquainted with representatives of the stream pollution control agency. He will often find that advice and assist-

ance which will be helpful will be obtained as a result of such contacts. Further than this it will be found that with few exceptions such men wish to work *with* industry on a cooperative basis. This can best be done by free exchange of information, omitting only such information as would be classed as trade secrets. A further advantage is that the pollution control agency will then be aware of the progress which is being made, any difficulties which may have been encountered, and will be able to tell interested persons, and the public in general, the things that industry is doing to abate pollution.

18. This last item is also considered to be of first importance. In fact, it is the very reason for the establishment of this Industrial Waste Conference at Purdue University. There should be as far as possible a free exchange of technical information on waste treatment methods between industrial companies. Such an exchange is fostered by meetings such as this and can be further served if those who are responsible for carrying out pollution abatement programs will maintain memberships in the leading technical societies and trade associations, and participate as far as possible in discussions concerning the subject.

Abel Wolman Sedgwick Medalist

Abel Wolman (Sc.D.) has again been honored by the Am. Public Health Ass'n, of which he is a past-president, this time as the recipient of the Sedgwick Memorial Medal "for distinguished service in the field of public health and sanitary engineering."

The award of the Sedgwick Medal was made during the last annual meeting of the Am. Public Health Ass'n in Boston, Mass. The citation stated that "Through his teaching and consultative services his influence has been felt not only across this continent but abroad. His statesmanship and wisdom are of a rare quality. The ready acceptance of his leadership reflects assurance of his position and in conference his word generally keynotes ultimate conclusions."

The achievements of Abel Wolman are too well known generally to warrant review in these columns, where they have so often been set forth in recording past awards and honors won by this brilliant scientist and long-time friend of the writer, and former co-worker.

Abel Wolman, now professor of sanitary engineering at Johns Hopkins Univ., and consultant to many important federal, state and municipal agencies, began his professional career as assistant engineer in the Md. State Dept. of Health, of which he later became Chief Engineer. He is a past-president of the Am. Water Works Assn. and served as Editor of the *A.W.W.A. Journal* for seventeen years. He was awarded A.W.W.A.'s Diven Medal and later an Honorary Membership in recognition of his outstanding services to the association.

The Sedgwick Memorial Medal for all-around achievement comes to Abel Wolman, the son of a Russian immigrant, merely as one more deserved recognition of his outstanding technical abilities, personality and brilliant leadership in his chosen field. —*Linn H. Enslow.*

F.S.W.A. to Meet In Boston In 1949

Meeting for the first time in New England, the Federation of Sewage Works Associations will stage its Twenty-second Annual Meeting in the Hotel Statler in Boston on October 17-20, 1949. Host to the Federation will be the New England Sewage Works Association, which will combine its Twenty-first Annual Meeting with the national convention.

Following the pattern of the highly successful gathering held at Detroit last October, the Boston conference will be 3½ days in duration, with one half-day session devoted to inspection trips of sewage and industrial waste treatment facilities. The usual manufacturers' exhibit and appropriate social events will be featured.

Assembly of the technical program has already begun as a regular function of the F.S.W.A. Publications Committee, of which F. W. Gilcreas is chairman. The Local Arrangements Committee will be headed by E. Sherman Chase, of the consulting engineering firm of Metcalf and Eddy. The General Convention Management Committee, consisting of Linn H. Enslow, Editor of *Water and Sewage Works,* Arthur T. Clark, Mgr. Water & Sewage Works Mfrs. Assn., and F. L. Flood, Consulting Engr. of Boston, is again headed by W. J. Orchard, Genl. Mgr. of the Wallace & Tiernan Co., with long experience in convention management procedure.

George W. Pracy New Chief Eng'r. & Gen'l. Manager San Francisco Water Dep't.

George W. Pracy, for a number of years Superintendent of the San Francisco Water Dept., has been appointed Chief Eng'r. and Gen'l Manager of the Department, succeeding Nelson A. Eckart, retired.

Mr. Pracy, a Fuller Awardee and past-chairman of the California Section of A.W.W.A., is a past-president of A.W.W.A., and a past-president of San Francisco Sect. A.S.C.E.

A "Native Son," having been born in San Francisco March 19, 1887, George Pracy received his early education in the public schools, attended Cogswell Polytechnical College of San Francisco, and was graduated in 1908 by the University of California as a Bachelor of Science. He entered the employ of the Spring Valley Water Co. of San Francisco in 1909, and rose to the position of Superintendent of Distribution in 1914. In this capacity he went over to the City in 1930 when the Spring Valley Co. was purchased by San Francisco.

Mr. Pracy, in addition to being an A-1 water works executive, is likewise an A-1 citizen of whom San Francisco is justly proud. He is a Mason and a past-president of the Kiwanis Club of San Francisco, also former Lieut.-Governor of the California-Nevada District of Kiwanis International, and Chairman of the Board of Trustees of Cogswell Polytechnical College.

15th ANNUAL CONVENTION CANADIAN INSTITUTE ON SEWAGE AND SANITATION

Meets in Canadian National Capital, Ottawa, Ont.

FOR the first time in its fifteen years of existence, the Canadian Institute on Sewage and Sanitation journeyed to the Canadian national capital, Ottawa, Ont., for its annual convention. The meeting was a huge success, and although it lacked 26 registrants of tying the record of 340 at Niagara Falls, Ont., in 1947, the actual attendance at the scheduled luncheon and banquet (257 and 277, respectively) was the highest ever.

This annual meeting was held in the spacious and beautiful Chateau Laurier Hotel on Nov. 1-3, 1948, where the famous Canadian "Club Room" entertainment had even more space and facilities available than usual. The "Club Room" is operated by the Canadian Sanitation Equipment Association.

New Officers

For the ensuing year, the following officers were elected to serve the Institute:

President
T. M. S. Kingston, City Engr. & Mgr.
Chatham, Ontario

Vice-President
L. G. McNiece, Engr.
Water Light and Power Commission
Orillia, Ontario

Secretary-Treasurer
Dr. A. E. Berry, Director
Sanitary Engineering Div.
Ontario Dept. of Health
Toronto, Ontario

Trustees elected include: C. S. Anderson, Supt. of Works, Tisdale Twp., South Porcupine, Ont.; and David Jack, City Engr., Kingston, Ont.; continuing trustees are D. A. R. McCannel, City Engr., Regina, Sask., and W. S. Orr, City Engr. & Mgr., Niagara Falls, Ont.

G. H. Ferguson Honored

At the annual banquet, which was preceded by a reception, the guest of honor was George H. Ferguson, a past president of the Institute, and retired Chief of the Public Health Engineering Division of the Dominion Department of National Health and Welfare. As a mark of the high esteem in which Mr. Ferguson is held, he was presented a silver tray. The eulogy was made by Dr. Berry, Secy. of the Institute, and the presentation was made by Rene Cyr, Asst. Chief Engr. of the Province of Quebec.

Guest speaker at the banquet was J. B. McElvoy, barrister of St. John's, Newf., and legal adviser to the Newfoundland Commission which negotiated confederation with Canada. His address dealt with the history of Newfoundland and its importance to Canada.

Representing the Federation of Sewage Works Assns., George S. Russell, immediate past president of F.S.W.A., brought greetings to the Canadian Institute and reviewed briefly the work of the Federation, its growth, and its service to member associations and their individual members.

Utilities and Housing Projects

"PLANNING AND CO-ORDINATION OF MUNICIPAL UTILITIES AND HOUSING PROJECTS" was the title of the talk by A. J. E. Smith, Asst. Supervisor, Ontario Region Central Mortgage and Housing Corp., Toronto, Ont. Mr. Smith's talk considered problems peculiar to Canadian practices which are therefore of lesser interest to readers on this side of the border.

Combined Sewers—Guided Discussion

The guided discussion on "PROBLEMS IN THE USE OF COMBINED SEWERS" was introduced by N. S. Bubbis, Engr. of Water Works and Sewerage, Winnipeg, Man. Mr. Bubbis called attention to the fact that the subject was timely in view of the rapid extension of the larger plants and the installation of sewers in smaller communities. In so doing, he reviewed the history of sewer systems, pointing out that the first sewers were for storm purposes while sanitary wastes were dumped in the gutters. Then followed combined systems and now the tendency is to have separate systems.

The guided discussion which followed included six questions:

(1) Under what conditions, if any, is it desirable to construct combined sewers, and how do costs, in general, compare for separate vs. combined sewers?

The first speaker was WM. STORRIE, Cons. Engr., Toronto, Ont., who said that in the final analysis, the an-

Photo by Dave Galloway, Toronto

New Officers

Standing—left to right—Dr. A. E. Berry, Director, Div. of San. Engr., Ontario Dept. of Health (Secretary); W. S. Orr, City Engr., Niagara Falls, Ont. (Trustee); L. G. McNiece, Engr. Water & Light Commission, Orillia, Ont. (Vice-President); C. S. Anderson, Engr., Tisdale Twp., S. Porcupine, Ont. (Trustee). Seated—left to right—T. M. S. Kingston, City Mgr.-Engr., Chatham, Ont. (President); G. H. Richards, City Engr., Brantford, Ont. (Past President)—Not included are D. A. R. McCannel, City Engr., Regina, Sask. (Trustee) and David Jack, City Engr., Kingston, Ont. (Trustee).

swer to separate vs. combined sewers lay only in a complete study of the local problems involved. In the majority of cases, the combined system is the least costly to construct. In low lying areas, it is usually advantageous to have separate systems, while high areas can often employ combined systems advantageously.

From the standpoint of sewage treatment, especially where complete treatment is utilized, separate systems are the more desirable according to Mr. Storrie, who also said that too often sewers designed for sanitary sewage are overloaded with roof drainage that should go into the storm sewer. In the construction of new systems it may be advisable in smaller communities to adopt the separate system idea and build the sanitary system first, especially in the present era of high prices.

W. F. M. Bryce, Engr., Ottawa, Ont., spoke about Ottawa's combined system and said that there is little problem there because no treatment plant exists at present. In one section consisting of a housing development for veterans, separate systems were installed, at a cost of 50 to 75 per cent more than a combined system would have been. Mr. Bryce expressed the opinion that combined systems should be constructed only where there is no sewage treatment.

In concluding the discussion on this question, Mr. Bubbis said that topography was an important consideration in determining which type of system should be constructed. Where there is little difference in elevation in the city, as at Winnipeg, combined sewer systems require pumping stations that would not be needed in separate systems.

(2) Where separate sewers are used, what precautions are necessary to prevent sanitary or industrial wastes from entering the storm sewer? Are these precautions effective? Is it feasible to exclude all pollution from storm sewers, or is it better to treat the excess storm water?

Mr. W. M. Veitch, City Engr., London, Ont., introduced the discussion on these questions, saying that in his city they had a combination of both separate and combined sewer systems. Only where the sewage is pumped is the separate system insisted upon.

Mr. Veitch believes that it is only through the industries themselves that steps can be taken to control the discharge of industrial wastes into the sewers. City councils are usually reluctant to impose drastic restrictions on existing industries. Industries located on the Thames River are themselves concerned over the pollution of the stream.

According to Mr. Veitch, storm waters are polluted from street washing particularly where horse drawn delivery wagons are still used as in many cities. When the normal flow increases to the high of storm conditions, then problems are created at the treatment works. Consideration is being given to converting a one mgd. plant in the heart of London to a storm water plant.

The City of London is planning to solve the industrial waste problem by adopting sewer-rentals. Prior to the introduction of this plan, every industry will be surveyed, and the attempt made to have strong wastes partially treated before discharge to the sewers.

Arthur W. Yaeck, Supt. Sew. Treat., Kitchener, Ont., said that in his city the discharge of sanitary and industrial wastes into the storm sewers was controlled by a plumbing by-law which states that no person shall connect to sewers other than in accordance with the law's specification for sewer use as shown by records in the city engineer's office. The application made at the time of connection is a signed agreement to abide by the rules. These precautions have proved effective.

When J. E. Hands, Pub. Util. Supt. at Clinton, Ont., asked what is to be done at a treatment plant when storm water gets in a separate sanitary system, N. S. Bubbis of Winnipeg, said that the usual procedure is to bypass the storm water over a weir.

(3) Is it feasible to convert a combined system to a separate system? What are the costs in relation to new sewers? What procedure would you follow for extensions to existing combined systems?

According to W. B. Redfern, Cons. Engr., Toronto, Ont., it is not feasible to convert a combined system into a separate one under ordinary conditions. Perhaps in the extension of systems, it may be feasible to convert a small section or to make the new system a separate one. Under normal conditions, one might expect that a combined system would be extended as a combined system, etc.

Mr. Redfern also believes that on account of the high cost of materials and labor, the trend is toward separate systems, but this generalization cannot be applied to specific problems.

W. G. Ure, City Eng., Woodstock, Ont., said that in his city it had been found feasible to go at least part way in conversion. The system originally designed for combined service was too small and so another separate system was built and gradually street connections have been changed so that now there are generally two systems in the town. As to relative costs, Mr. Ure said that if the two sewers were laid in the same trench, the cost would be 15 to 20 per cent greater than for a single sewer. If laid in two separate trenches, the cost would be 35 to 40 per cent greater.

Wm. Storrie said that he knew of only one place where a combined system had been recommended for abandonment and replacement by two separate sewers. This is in a lightly populated section of Detroit, Mich., where the original combined sewer will be used for sanitary waste, and the new sewer will serve for storm water.

(4) How does the maintenance of combined sewers compare with that for separate sewers? Is the cost of maintenance of plumbing more favorable under combined than separate sewers?

W. H. Reihl, City Engr., Stratford, Ont., believes that maintenance of a separate sewer is greater than for a combined system, because the total length of sewer is greater for the two separate sewers than for the one combined sewer. The plumbing cost would also be greater for the separate system.

In making a decision as to whether to use separate or combined sewer systems, in spite of increased maintenance, several factors must be taken into account. For example, length of sewer outfall to the sewage treatment plant will dictate a separate system if the distance is long. Quality of water to the receiving stream will also have an effect on the choice of separate or combined sewers.

The big question, according to Mr. Reihl, is what shall be allowed to enter the storm sewer and what shall be allowed to enter the sanitary sewer. Should weeping tile and cellar drains go to the storm sewer? If so, the depth of the sewer will have to be greater.

(5) Where separate sewers are used, what difficulty is experienced in keeping roof water and land drainage from the sanitary sewers?

C. S. Anderson, Supt. of Works, Tisdale Twp., South Porcupine, Ont., said that his local plumbing laws made definite provisions that no roof drainages shall go into the sanitary sewers.

Nicol MacNicol, Commissioner of Works, Forest Hill, Ont., stated that they paid for treatment by the North Toronto Plant according to metered volumes and therefore tried to keep the flow at a minimum. Every effort is made to keep roof drainage out of the sanitary sewers; apparently these efforts are successful because the sanitary sewage flow is between 50 and 55 gal. per cap. per day, or approximately the same as the water consumption.

Mr. MacNicol recommends that both the storm water and sanitary sewers be installed at the same time, otherwise there will be a tendency for the householder to connect roof drainage to the sanitary sewer system.

WM. STORRIE said that if land drainage enters the sanitary system, it usually is due to faulty joints in the sewer, but if roof drainage enters the sanitary system, it usually is due to faulty municipal control.

(6) Where combined sewers are used, what dilution of dry-weather flow should be taken into the treatment plant or pumping station? Is treatment of the excess flow desirable, and if so, in what way?

W. H. COLLINS, City Engr., Hamilton, Ont., expressed the opinion that 1½ to 2 times the dry-weather flow may be handled by the treatment plant.

J. D. CORCORAN, Commissioner of Works, East York Twp., Ont., said his plant takes 2½ to 3 times the dry-weather flow.

N. S. BUBBIS, Winnipeg, stated that in his city the factor used is 2¾ times the dry-weather flow.

Garbage Grinding

In the absence of Morris M. Cohn, Editor, *Sewage Works Engineering*, and Sanitary Engineer, Schenectady, N.Y., his paper on "GARBAGE GRINDING IN THE HOME—AN ACHIEVEMENT IN SANITATION," was read by NORMAN HOWARD of Toronto. Mr. Cohn's paper dealt with the problem of disposing of home food wastes and made particular reference to the construction and operation of the General Electric Disposall unit, which has been on the market for more than a dozen years.

Following Mr. Howard's reading of the paper, the presiding officer, G. H. RICHARD, City Engineer, Brantford, Ont., requested DR. GEORGE E. SYMONS, Assoc. Editor, *Water & Sewage Works*, New York City, to discuss the paper from the floor. Dr. Symons emphasized the point that engineers should understand that the promotion of the use of garbage grinders will not eliminate the collection of certain other types of refuse. While it will be many years before whole communities are completely equipped with such grinders, the sale of these units is growing. Before the war some 50,000 units had been installed, but last year one company alone made more than 100,000 units. Before the war there was but one manufacturer but now there are fourteen companies making household garbage grinders.

That garbage is readily treatable and digestible is evidenced by the fact that in several cities the garbage is ground at the treatment plant. At Marion, Ind., the ground garbage is discharged directly to the digesters, where it produces an amount of gas comparable to that from sewage solids. When the ground garbage is discharged to the sewage at a treatment plant it generally increases the soluble B.O.D. by about 30 per cent, according to Dr. Symons.

As to quantities of solids from ground garbage, it has been variously estimated that the per capita garbage output is from 0.4 to 0.5 lb. per day. On a dry basis, this amounts to approximately 0.15 to 0.25 lb. per cap. per day, which means that the suspended solids content of the sewage with garbage would be about twice that in normal sewage.

While ground food wastes only increase the flow by about one per cent, the effect on grit chamber and settling operation perhaps needs some further study, inasmuch as garbage solids settle faster than sewage solids. Some cities in the United States have passed ordinances to prevent the installation of these home grinders, others have no restrictions, and at least one is planning on making an installation service charge and placing the money in a special fund to be used to construct additional treatment works when the load from garbage grinders necessitates additional facilities.

Dr. Symons said that George Schroepfer at Minneapolis had calculated that the annual cost per capita for treating the ground garbage at the treatment plant would be 55 cents. Others have estimated the cost at less than that figure.

NICOL MACNICOL, Commissioner of Works, Forest Hill, Ont., said that there were a few installations in his city where the sewage is treated by the North Toronto treatment plant. Before allowing the installation of any units, the City of Toronto was consulted and a policy laid down that garbage grinders would be accepted for private houses but not for apartment houses.

GEORGE S. RUSSELL, Cons. Engr., St. Louis, stated that in St. Louis County most new houses are being equipped with garbage grinders. In one city of 35,000, according to Mr. Russell, the solids resulting from garbage grinders amounts to 0.3 lbs. per cap. per day. Mr. Russell also pointed out that the difficulties in the carrying of garbage solids in sewers was not on flat grades, but on steep grades where the water ran away from the solids leaving them to dry on the pipes.

When MR. VEITCH of London asked if any city had the authority to charge for handling residues from garbage grinding, Mr. Russell said that this could be covered in a sewer rental based on volume, suspended solids, and B.O.D. In one ordinance, provision is made that any B.O.D. greater than 200 ppm. is to carry an extra charge of 1/5 of 1 percent for each ppm. as determined by test.

Ottawa's Sewers

"THE OTTAWA SEWERAGE SYSTEM" began in 1754 according to W. F. M. Bryce, Sewer Engineer, Engineering Dept., Ottawa, Ont. There is no treatment plant as yet and all main sewers were constructed before 1920. The construction of a treatment plant will, no doubt, call for additional sewers. Storm runoff is not serious. Paving of the streets brought additional costs for installing sewers. More than 2½ million dollars has been spent for storm sewers since 1930.

Photo by Dave Galloway, Toronto

George H. Ferguson Receives Silver Tray

In recognition of service to the C.I.S.S. and to the Public Health Engineering Division of the Dominion Department of National Health and Welfare, George H. Ferguson, retired Chief of the Division, is presented a silver tray by Rene Cyr, Asst. Ch. Engr., Quebec Ministry of Health.—Head tablers are Nicol MacNicol, past president, T. M. S. Kingston, incoming president and G. H. Richards, retiring president.

Refuse Collection

Two papers were presented on the subject of "REFUSE COLLECTION PRACTICE"; one by N. MacNicol, Commissioner of Works, Forest Hill, Ont., and the other by Jean Asselin, Asst. Director, Public Works Dept., Montreal, P.Q. In the absence of Mr. Asselin, his paper was read by Louis Crepeau, City Engr., St. Hyacinthe, Que. Because of the length of the guided discussions, it is regretted that these papers cannot be reported.

Sewage Pumping Stations—Guided Discussion

This topic was conducted under the chairmanship of L. G. MCNIECE, Engr. of the Orillia Water, Light, and Power Commission, Orillia, Ont. Mr. McNiece pointed out that not too many years ago sewage was pumped by pumps made for pumping water, but now special pumps have been designed for the purpose. Centrifugal pumps with open impellers, and with wider passages have reduced the clogging to a minimum. For smaller installations, the submerged, vertical, centrifugal pump is commonly used.

N. MacNicol
Comm. of Wks.
Forest Hill
Ont.

N. S. Bubbis
Engr.
Water & Sew.
Winnipeg

Wm. Storrie
Cons. Engr.
Toronto
Ont.

W. M. Veitch
City Engr.
London
Ont.

Programmers

Sewage pumps are usually automatic in operation, controlled by floats, which for best results should be arranged in a tube to guide it and protect it. Where possible pumps should be installed in dry wells, where they are accessible for maintenance and repair.

There were five questions in this guided discussion:

(1) What are the most important factors in operating sewage pumping stations?

E. E. W. OKE, City Engr., Waterloo, Ont., said that cleanliness is a very important factor, and L. F. ROBERTON, Sewage Disposal Engineer, London, Ont., said that a wide awake conscientious operator who will take pride in the equipment is a necessity.

F. G. BROWNE, Engineer of Teck Twp., Kirkland Lake, Ont., stated that an adequate stand-by source of power and a spare pump are necessities.

(2) Is clogging of pumps a problem, and how can this best be prevented?

A. E. CHALMERS, City Engineer, Peterborough, Ont., said that where trouble had been encountered in an industrial waste the trouble was corrected by installing a screen.

F. G. BROWNE, Kirkland Lake, said that silk stockings gave some trouble because they occasionally become wound around the impeller and are difficult to remove.

W. H. COLLINS, Deputy City Engr., Hamilton, Ont., believes that there should be at least two handholes in each pump to enable clogging material to be removed.

(3) What kind of power is best suited for sewage pumping? Are standby units with alternate power needed? What types of control give the least trouble in operation?

C. G. R. ARMSTRONG, Cons. Engr., Windsor, Ont., believes that electric power is best suited for sewage pumping because it is economical and gives smooth operation and has low maintenance costs. In smaller installations standby units are not needed as often as in larger plants, but where continuous operation is essential then standby power cannot be eliminated. Float switches are the most common means of control of pumping. Pressure switches may be used to control operation in a closed system. Electrode control is not common in sewage pumping plants.

F. G. BROWNE, Kirkland Lake, favors electric power and uses two types of standby units. In the larger station an automatic starting gasoline engine-driven-generator is used to supply standby current. In the smaller stations, Pelton Water Wheel water motors are used. These are connected by bevel-gear drive to vertical pumps and are controlled by hydraulicly-operated gate valves.

(4) Should pumps be placed in a dry well, and how can motors and other equipment best be protected from the effects of moisture?

At Port Arthur, Ont., S. E. FLOOK finds that a recent pump installed in a dry well is satisfactory. A sump pump is used to keep the pit dry.

F. C. BALL, Sewer Engr., London, Ont., stated that in every case pumps in dry wells, with sumps connected to the suction of the pumps ensured proper drainage and operated very satisfactorily.

R. V. ANDERSON, Cons. Eng., Toronto, Ont., said that proper ventilation was essential to keep motors dry in underground stations. Manufacturers should be consulted regarding the desirability of moisture-proof motors and controls. Pumps should not be installed in wet wells.

(5) What supervision is needed for sewage pumping stations? What are your costs for operation? Is the shape of the bottom of the well important?

G. H. BAKER, Eng., North York Twp., Willowdale, Ont., stated that two good rules for operation of sewage pumping stations are to have electrical controls above ground to avoid condensation, and to have pumps below ground to permit priming. The bottom of a wet well should be sloped to a sump so that it can be pumped out when required.

H. L. PRINGLE, Supt. Pub. Util., Whitby, Ont., described the installations in his treatment works.

Sewage Plant Operation—Guided Discussion

The third guided discussion was presented under the chairmanship of W. M. Veitch, City Engr., London, Ont. The topic was "OPERATING PROBLEMS IN SEWAGE TREATMENT PLANTS," and there were five questions discussed.

(1) Is any treatment of industrial waste effluent required before its discharge into your municipal sewer? What regulations governing industrial wastes are now in force? What difficult wastes do you encounter, and what effect do they have on the operation of your plant? What regulations if any govern the discharge of oil and grease into the sewers by Service Stations, during the periods of summer and winter changeovers?

In Guelph, according to H. S. NICKLIN, City Engr., only two industries give special treatment to trade wastes before being discharged into the sewer system. Both are outside of the city limits; one is a meat packing plant and the other cans fruits, pickles, etc. Both plants use screens and settling tanks.

Occasionally benzine or kerosene has been received at the treatment plant, and sometimes storm sewers discharge blue, red, and green waters, the source of which is not known.

ARTHUR W. YAECK, Supt. Sew. Treat., Kitchener, said that his city was highly industrialized with three meat-packing plants, three large tanneries, textile plants, rubber factories, etc. Many troublesome wastes are received at the treatment works. These include hair, paunch manure, meat scraps, felts, etc. Generally speaking, industries have been most cooperative after the problems of sewage treatment plant operation were explained to them. Vibratory screens have been used to remove paunch manure, meat scraps, etc. Grease traps have been helpful, too. From tanneries the worst problem is hair, which causes mats on the surface of digesters. Greases from packing plants are a nuisance, and lime, hair, and grease build up on the inside of sludge lines.

Service stations are required to install pits for floor washings, to catch greases and oils and keep them out of the sewers.

W. H. RIEHL, City Engr., Stratford, Ont., said they had no regulations but that good cooperation with the industries had been obtained by advising them of the city's preference regarding the discharge of industrial wastes. The most difficult waste is from a packing plant. Next most troublesome is a textile dye plant. In the former case preliminary settling at the industry is effective in removing many solids. No regulations exist regarding the discharge of oil and grease from service stations.

W. M. VEITCH, London, reported that troubles were experienced with a sugar waste discharged from a cereal factory. Discharges from dry cleaning establishments are checked because of the danger of these flammable materials in the sewers.

DR. GEORGE E. SYMONS, Assoc. Ed., *Water & Sewage Works*, New York City, asked if any Canadian cities employed special sewer service charges for industrial wastes. He explained that in the United States there is a growing tendency toward charging for industrial waste where it is stronger than should be expected for the volume of water discharged. Dr. Symons explained the workings of the Buffalo formula of which he is co-author.

H. S. NICKLIN of Guelph replied that in his city they charged $40 a month to two industries by agreement and by special by-law.

When W. H. REIHL of Stratford asked about the effects on industry, and whether or not such charges would tend to drive industry away, Dr. Symons replied that there must be cooperation between the municipal officials, and between the chambers of commerce, and the health services when it comes to promoting industries within a municipality.

(2) What experience have you had with an overloaded plant and what procedure is best to facilitate the operation of plants which are overloaded?

E. H. MUNROE, Supt., Sewage Treat., York Twp., Ont., asked if there are any plants that are not overloaded except on the drawing board, and he emphasized the need to convince municipal officials of the need for enlarged sewage treatment works.

G. H. BAKER, Engr. North York Twp., Willowdale, Ont., said that his plant is so overloaded that the only satisfactory means of handling the problem is to chlorinate the effluent and to enlarge the plant.

(3) What is your opinion of the practice of returning sludge from secondary settling tanks to the inlet of the primary settling tanks?

WM. STORRIE opined that this is an operating problem and L. F. ROBERTON said that in London new tanks being constructed were not being planned to have sludge returned to them.

(4) What effect on a sewage treatment plant is to be expected from the discharge of ground garbage into sewers? Should it be permitted?

W. M. VEITCH said that in London there is a plan to grind the garbage and truck it away with undigested sludge for spreading on farmland.

(5) Is consideration being given by municipalities to the adoption of "sewer rental charges" for the financing of sewage treatment plants and trunk sewers? How will it be applied?

E. E. W. OKE, City Engr., Waterloo, Ont., said that in Cochrane the sewer-rental scheme was used as a political football, but he believes that the plan is highly desirable, and W. M. VEITCH said that a sewer-rental plan would be presented to the city council of London in 1949.

Sludge Disposal Symposium

The first paper presented in the "Symposium on Sludge Disposal" was by L. F. Roberton, Sewage Disposal Engr., London, Ont. Mr. Roberton spoke on "DISPOSAL OF SLUDGE IN LIQUID FORM FOR USE AS A FERTILIZER," and pointed out that this method of disposal had its origin with the Chinese in ancient history. In 1894, Rafter and Baker suggested that liquid sludge be spread on farm lands and plowed in as soon as possible. Only recently has this practice been followed to any extent and among the cities using the method are Stratford, Guelph, East York, and London. It was also used at some Canadian Army camps during the war. In London the method of disposal to farms was chosen over vacuum filtration in 1936 and has been used since. A contractor is paid to remove the sludge and sells it to farmers.

Programmers

Louis Crepeau
City Engr.
St. Hyacinthe
Que.

W. C. Miller
City Engr.
St. Thomas
Ont.

Geo. S. Russell
Cons. Engr.
St. Louis
Mo.

W. H. Collins
Sew. Engr.
Hamilton
Ont.

As a health caution, Mr. Roberton said that sludge should not be used on root crops or on leafy crops which are eaten uncooked. Applications are according to these specifications:

	Cu. Yd. per Acre
Heavy land for grain crops	25 to 40
Hay crops	50 to 60
Hay on light land	60 to 70
Corn crops	80 to 100
Pasture lands	light to 50
Orchards—Application in late fall.	

Caution must be exercised in the frequency of application, and farmers using the sludge must obtain a permit before its use. The contractor has three trucks of 5 cu.-yd. capacity, a tractor and a plow. One advantage of this method of disposal is that it can be carried on continuously except, of course, in extreme winter conditions.

The sludge removed from the settling tanks has a solids content of approximately 6.3 percent. Removed on contract this method of disposal costs about 35 to 40 cents per cu. yd. or approximately $6.50 to $7.00 per ton of dry solids.

Sludge Digestion

I. H. Nevitt, Engr. of Sew. Treat., Toronto, Ont., presented the second paper in the symposium, and discussed "SEWAGE SLUDGE DIGESTION AT THE NORTH TORONTO SEWAGE TREATMENT PLANT." The paper was devoted to a description of the plant and the changes made to double the capacity of the treatment works. Gas is burned to provide heat for the digesters as well as for general heating. Seasonal effects have been noticed in digestion of sludge. The solids content of the sludge goes up in winter and down in the summer, and some difficulties are experienced in drying sludge in the winter.

One of the problems is fine sand which appears in the overflow liquor chamber. Its source has been unexplained. Liquor is drawn off at levels beneath the scum to prevent clogging of draw-off pipes. The sludge to the digesters contains from 40 to 50 per cent of activated sludge. Gas produced amounts to approximately 10 cu. ft. per pound of volatile solids added. Volatile solids reduction is calculated at approximately 53 percent.

Sludge Dewatering

E. H. Munroe, Supt. Sew. Disp. Plant, York Twp., Ont., presented the third paper in the symposium. His paper was titled "SLUDGE DEWATERING METHODS." He discussed the need for a certain moisture content in sludge, if it is to be discharged as liquid fertilizer, and on the other hand, the desire for a minimum of moisture content if the sludge is to be handled in other ways. For disposal as liquid the moisture content should be 77 to 81 percent; less than that causes glutinous characteristics. Sludge sold in bulk or bagged generally has 10 to 15 percent moisture. Methods of dewatering sludge include sand filters, pressure filters, and vacuum filters.

Mr. Munroe discussed the design and operation of vacuum filters in some detail, and the dewatering process that must precede the use of vacuum filters. The speaker also described the Porteous process, a method which has been developed for sludge conditioning without the use of chemicals. It makes use of the reaction of sludges to the simultaneous application of heat and pressure. The sludge is pumped through heat exchangers in which high pressure steam is the source of heat and pressure. Thereafter the sludge is pumped to storage tanks for cooling and decantation of liquid. The remaining sludge may be conveyed to filters where its moisture content is reduced to 40 or 50 percent. The sludge can be used for fuel or for fertilizer.

Financing Sewage Works—Guided Discussion

Under the chairmanship of WM. STORRIE, Cons. Engr., Toronto, one guided discussion was devoted to "LOCAL IMPROVEMENT AND OTHER METHODS OF FINANCING SEWAGE WORKS." Five questions were presented:

(1) Has the Local Improvement Act outlived its usefulness?

Messrs. E. F. BARRATT, Town Engr., Weston, Ont., E. M. BAIRD, Engr. Scarborough Twp., Ont., and W. C. MILLER, City Engr., St. Thomas, Ont., were agreed that the Local Improvement Act needed some revisions but was still useful as a means of financing sewer improvements.

(2) Do you believe assessment for a front footage charge for private sewer service to be equitable and how do you recover the cost of such private sewer or water service?

Messrs. W. C. MILLER of St. Thomas and W. C. ORR of Niagara Falls, Ont., believe the act could be made more workable. E. H. MUNROE of York Township said their practice was to assess the cost of the private connection at a fixed rate based on the size of the sewer.

(3) The law provides that the construction cost of a sewer may be assessed on a front footage basis up to fifty per cent of the cost if the city council so votes. What practice do you follow under this section?

W. C MILLER, St. Thomas, says that such assessment is made only when the sewer is a service sewer in that street. WM. STORRIE said that the local improvement charge in one city was based on a 15 in. sewer with the municipality bearing the cost for anything over a 15 in. sewer. L. CREPEAU, St. Hyacinthe, Que., said that only 50 per cent of the cost was charged on a footage basis to the property.

The other questions in this discussion were of a nature of interest only to municipalities in Canada, and are therefore not reported here.

The last guided discussion session was to have dealt with miscellaneous problems, such as fly ash, basement flooding, etc., but because of lack of time these questions were not brought to the floor.

E. J. CLEARY APPOINTED EXECUTIVE DIRECTOR OF OHIO RIVER VALLEY SANITATION COMMISSION

Edward J. Cleary, Executive Editor of *Engineering News Record,* has been appointed to the position of Executive Director and Chief Engineer of the Ohio River Valley Sanitation Commission. Cleary, who has been associated with the McGraw-Hill Publishing Co. since 1935, assumes his new post on Feb. 1.

A graduate of Rutgers University in 1929, where he earned three degrees in engineering, Ed. Cleary was first associated with Dr. Willem Rudolfs at the New Jersey Agr. Expt. Station at New Brunswick.

Cleary has a broad background of technical and public relations experience in the field of sanitary and civil engineering. During the war,

he was accredited as a war correspondent for ENR to report on the work of military and civilian U.S. engineers in South America. Since the war he has served as a consultant to the health and sanitation division of the Institute of Inter-American Affairs.

A registered professional engineer and a part time lecturer on public works organization in the College of Engineering at New York University, Mr. Cleary is now serving as a vice-president of the Amer. Pub. Works Assn. He is a member of A.S.C.E., A.W.W.A., F.S.W.A., I.A.A.S.E., Sigma Xi, and Tau Beta Pi.

The Ohio River Commission has already notified every city in the Ohio Basin to proceed "within a reasonable time" with a sanitation program that will comply with the Water Sanitation Compact. Industries will receive similar notices. Tennessee, N. Carolina, Alabama and Georgia have been invited to join the other eight states in the compact.

FINANCING DISTRIBUTION SYSTEM EXTENSIONS*

by
ALFRED O. NORRIS
Vice-Pres. and Gen. Mgr.
BIRMINGHAM WATER WORKS CO.
BIRMINGHAM, ALA.

MANY methods and practices followed in the extension of distribution systems into new territory, many of which are not producing the income they should be and require review and careful analysis to determine whether or not they are properly financed. It is quite conceivable that many extensions, although bringing in additional revenue, are, in fact, a financial burden on the system as a whole.

Equitable Rate Structure a Major Consideration

In considering this subject, there is one major factor to keep in mind—the rate structure or schedule. Almost every water works operator, whether his plant is publicly or privately owned, will find it most distasteful and difficult to revise the rate schedule of his property unless he is able to make the revision downward. It will be assumed, therefore, that it is the desire, and should be the responsibility, of every operator to approach the expansion of the water works system with an eye toward the preservation of the existing charges for water service. Precaution should also be taken to prevent the necessity of increasing the rates charged existing customers to help defray the costs of taking on new customers supplied by main extensions not properly financed.

Two factors must be considered in the proper financing of an extension: first, the revenue of the particular extension and the increase in operating expenses it will cause; and second, the additions to plant and property — such as services and meters—as well as the investment in pumps, filters, reservoirs and the like, that will be required to supply adequately the extension and the consumers taking water from it.

Calculating Probable Revenue

The calculation of the probable revenue from an extension can be approached from several angles. Rather than estimating the total revenue an extension may produce and working out the financing from this point, it is better and safer to eliminate as much guesswork as possible. There never is the certainty that all the lots will be built upon and, if built upon, that the units will be occupied. To reduce these uncertainties to a minimum, it is, therefore, best to work out the problem by giving consideration to the additional revenue as water customers become attached to the mains.

From the general character of the development and its location, as well as the size and design of the units, it is not too difficult to arrive at an average estimated revenue to be expected from each unit to be served by the extension.

The probable operating expenses of an extension—or rather the increase in the operating expenses of the property as a whole due to the addition of the new customers—cannot be properly approached by any method other than average costs. It would require an exhaustive study to find out by what increment each new customer would increase operating expenses, and if this increment were to be determined for each new customer it would naturally have to vary. Such an approach would also make it necessary to determine just which new customer required the hiring of an additional employee in the water works organization. As the development of this paper will show, the economies of an extension can be properly treated only on an overall basis and with a long-term view.

Average costs can best be expressed by giving consideration and weight to the operating ratio, the percentage of the gross operating earnings expended for operation and maintenance. Deducting this figure from the gross operating earnings gives the return—that is the amount available to meet the costs of borrowed capital and to provide a profit. Operating ratios are not the same for all properties as each has its own particular problem, affecting in one way or another the relationship between revenues and expenses. The operating ratio of a single property will, however, remain fairly constant from year to year, moving in one direction or the other rather slowly. To determine the operating ratio of a property for use in calculating the earnings of an extension, it would be well to figure it out for a number of years in order to eliminate any years during which some unusual event occurred and materially disturbed the operating ratio for that year.

Example

To take an example, it may be assumed that the estimated gross revenues from the extension under consideration average $15.00 a unit and that the operating ratio of the water works property which is making the extension is 40 per cent. The return from each unit, disregarding other matters, will, therefore, be $15.00 minus $6.00 (40 per cent of 15), which leaves $9.00. This $9.00 is the amount of money that will be available from each unit to support the investment in the pipelines, service lines, meters and other materials making up the extension as well as other additions to the plant as a whole.

Investment Required in Other Facilities

It is at this point that the greatest tendency exists for making errors and omissions in the proper financing of distribution system extensions. Small properties which have no prospects of further growth and at the same time have ample supply facilities can assume that a reasonable return on the investment in the extension alone is sufficient. Should it develop, however, that the property needed some expansion of its supply, the earnings of the property under existing rates would not be sufficient to support an investment in additional supply facilities, which, by their very nature, are not revenue producers. In determining the proper financing arrangement for distribution system extensions, consideration must also be given to the required investment in other plant facilities.

Admittedly, additional investments in plant facilities, other than pipelines, are not in the same category as the investments made in pipelines.

*This paper, presented before Ala.-Miss. Section of the Amer. Water Works Assn., is here published by permission of the Association.

Plant facilities are added in larger steps and at uneven rates.

However, assuming that the development of plant facilities has been kept reasonably abreast of the growth of the distribution system, and records have been accurately maintained, the ratio of the total cost of, or investment in, pipelines alone to the total investment will provide a very useful figure in determining what the proper return on a pipeline extension should be. This ratio is arrived at by dividing the total cost or investment in pipelines, fire hydrants and fire hydrant branches by the total plant value. The figure should not vary much from year to year in the future, as it is based on total values over a long period and yearly variations will be small by comparison.

Apportioning the Investment

Assuming that the investment in pipelines alone of the water works property mentioned above is 45 per cent of the total value of the plant, for every $45 invested in pipelines another $55 will eventually have to be expended for all other facilities needed to render service to customers on the extension under consideration. Put in another way, this means that, at the particular imaginary plant, for every $1.00 invested in water mains, fire hydrants and hydrant branches $1.22 will have to be spent on other facilities.

It was found previously that of the $15.00 of estimated revenue for each unit, $6.00 would be spent on operating expenses, leaving $9.00 available to support the investment in the facilities needed to supply each unit. For the purposes of this paper, a return of 6 per cent on the value of the property will be assumed sufficient to cover the overall costs of borrowed money and a reasonable profit. The $9.00 using the figure of 6 per cent will therefore support an investment of $150. This $150, unfortunately, is not the amount of money that can be prudently spent on pipelines for each of the $15.00 customers expected on the extension under consideration. To take care of the cost of other facilities to supply each of these new customers, only 45 per cent of the $150, or $67.50, can be invested in water mains. The remainder, $82.50, will have to be spent on other facilities, such as meters, services, pumps and filters, if the existing relationship of the cost of mains to the total value of property holds true.

If the need for investment in all possible facilities other than mains is neglected when arriving at the return an extension should yield, it will become necessary to increase water rates at some future time. If all the revenue available from an extension is used to support the investment in pipelines alone, there will not be any cushion of revenue to support the investment in other needed facilities, such as added filter and pumping capacity. Furthermore, should it be found necessary to increase rates to support the cost of added facilities because of such omissions, the increased rates would be imposed on the old customers for whom the additional facilities were not needed, as well as on the new customers.

Calculating Return Necessary

With an operating ratio of 40 per cent, a figure of 45 per cent representing the ratio of the value of pipelines to the total value of the plant and 6 per cent as a fair return, $15.00 of revenue could support an investment of $67.50 in pipelines. This represents a gross return of 22.2 per cent, calculated by dividing $67.50 into $15.00. The dollar figures can be eliminated and, using only the three percentages, the same 22.2 per cent can be arrived at thus:

$$\frac{0.06}{0.60 \times 0.45} = \frac{1}{4.5} = 0.222 = 22.2\%$$

The 22.2 per cent figure means that a water works property operating under the above conditions must earn 22.2 per cent of the cost of a pipeline extension to pay the increased operating expenses and receive a return of 6 per cent on the cost of the extension and the cost of other necessary additions to its supply facilities used in rendering service to the extension customers.

As mentioned before, probably no two water works properties have exactly the same operating ratio or relationship between the total value of pipe and the total value of plant. However, assuming that records have been kept so that it is possible to determine what these two percentage figures are, and that the desired return has been established, the same calculations as above can be made to determine what the gross yield on a pipeline extension should be, expressed as a percentage of the cost of the extension.

Assuring the Proper Return

When it is apparent that a pipeline extension will not yield the desired gross return on the cost of pipeline installation alone, it is quite essential that some arrangement be agreed on so that the water property will be assured of the proper return.

One way would be to work out with the developer, or a representative of the customers to be served by the extension, an agreement by which the water property would be guaranteed the required return (22 per cent in the example used). The water utility would then keep an account of the revenue collected on the extension each year and calculate what percentage of the cost of the extension this revenue represented. The guarantor would then make up the difference between the percentage found and the guaranteed amount, until such time as the actual annual revenue collected equalled or exceeded the required amount.

This type of contract does not have much appeal to a developer or an individual, because of its continuing nature. Furthermore, it would not be of much value to the utility unless the credit of the guarantor were well established. The most satisfactory arrangement from the utility's point of view, and also from the developer's, is to have the entire cost of the pipeline extension placed on deposit with the utility. The utility then has the money and the developer has some definite figure to work with for the determination of his costs of development.

Since the utility can calculate what its gross return on an extension should be, it ought to be willing to refund to the depositor sums of money which would be representative of the amount the utility can afford to invest for the revenue produced by the new customers added to the extension. Using the same gross return of 22.2 per cent and the estimated revenue of $15.00 previously assumed for each unit on the extension, the utility can afford to refund, for each unit added to the extension, a sum equivalent to $15.00 divided by the desired gross return of 22.2 per cent, or $67.50. This should be recognized as the same figure previously arrived at.

Expressed in another way, using the reciprocal of 0.222 which is 4.5, and multiplying: $4.5 \times \$15.00 = \$67.50$. This reciprocal can be used to express briefly what the utility can invest in pipeline extensions; namely, 4½ times the estimated revenue.

This factor of 4½ would not hold true for all properties, but a similar figure can be developed for any given utility.

GEOLOGIC CORRELATION AND HYDROLOGIC INTERPRETATION OF WATER ANALYSES*

by

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WHEN the water users of Peoria, Ill., realized that a receding water table in wells of limited depth was critically affecting the water supply for the many industries and for the municipality, they asked the Illinois State Water Survey to collect data and to conduct studies to determine the source and amount of available water in the vicinity. In view of the fact that Peoria is a highly industrial city located on the Illinois River and centrally situated in the Illinois corn and grain belt, serving as a center for processing some $40,000,000 worth of farm products annually, the problem was considered of first importance.

Preliminary calculations (1) showed that the limited storage in the area of heavy withdrawal could not provide the amount of water needed for industrial and municipal purposes without recharge from external sources. It was also observed that the quality of the ground water was not constant either throughout the area or at any particular well. As a part of the investigation, water samples were collected for partial analysis to determine the extent of variation in quality and to determine the actual character of the waters from the various sources.

Since it was found, by correlation, that the water from a particular source is of generally constant character, it became possible to interpret the analytical data to show the origin of the waters obtained in each well field. Changes in character that occurred at any particular well were accompanied by relative changes in hydrostatic pressure in the immediate vicinity as a result of both extraction and recharge. It was therefore necessary to consider rainfall, river elevations and such pumpage records and water level data as were available.

The study considered the water quality of the Illinois River and the industrial and municipal well fields of Peoria, as well as those of Peoria Heights, East Peoria and Pekin. All available records on farm and community wells in the surrounding area roughly within a 25-mile radius were also included. With few exceptions, only drift wells above the bedrock were examined in the study, these ranging in depth from about 50 to 300 ft. Water from the bedrock is not considered in this discussion, as it is highly mineralized and is not a major water supply factor in the area.

The Author

Glacial Deposits

The immediate Peoria-Pekin area offered no fixed reference values for the quality of water to be expected from any particular glacial deposit, because extraction and recharge during the history of well water use in the area have altered the composition of the available water in the formations and continue to do so. To establish a working basis for comparison, however, well water samples were obtained from the geologic formations in the region surrounding the area under study.

In a recent unpublished report (2) on ground water geology of the Peoria Region, it has been shown that a broad buried valley connected with the Mississippi River existed at one time about 20 miles east of Peoria. Bedrock elevations vary from 300 to 750 ft. msl. (mean sea level datum), and the ground surface varies from 440 to 850 ft. msl. This buried rock valley is now filled with a pre-glacial or early glacial sand deposit (called Sankoty sand) to an elevation of about 500 ft. msl. This sand is also found in places along and under the present Illinois River and at the base of another buried valley north and west of Peoria (Figs. 1, 2).

The Sankoty sand is covered almost uniformly by the Illinoian glacial till. This was extensively cut by streams and does not constitute a major source of water. For the most part the Sankoty and Illinoian formations are overlain by the deposits from the Wisconsin glacial period. These Wisconsin moraines and till sheets are extensive and cover almost the whole area. There has been considerable erosion along the present Illinois River, outwash deposits being found there and also as narrow fringes bordering the moraines. The deposits are thickest in these areas. For the most part, water is found only in discontinuous and lenticular deposits in the Wisconsin drift, but the outwash deposits below the lower terrace along the Illinois River are generally well stratified and are therefore favorable areas for ground water development.

Water Quality Distinctions

Water from the Sankoty formation was invariably found to be characterized by a low sulfate content and by the presence of appreciable concentrations of ammonia and iron. Examination of 66 samples showed these waters to have a sulfate content below 7 ppm. The iron content found was invariably greater than 1.0 ppm., and there was up to 10 ppm. of ammonia.

Waters from the Wisconsin drift and the glacial outwash deposits are characterized by the presence of appreciable sulfate concentrations. A further distinction was apparent in the nitrate content. Waters from glacial outwash deposits and from outwash valleys cut in any of the lower formations almost always contained large amounts of nitrates. Twenty-one samples from wells penetrating glacial outwash were found to contain 12 to 425 ppm. of nitrates. The ion content of these samples was frequently, but not always, low, and the sulfate content ranged from 40 to 207 ppm. Some wells in the Wisconsin formation, near the areas where the bedrock

*Presented before the Water, Sewage and Sanitation Chemistry Division of the A. C. S. and published here by permission of the Amer. Chem. Soc.

outcrops, yield water of from 600 to 1,000 ppm. of sulphates.

Nineteen water samples from lenticular sand deposits in the Wisconsin drift areas contained 0 to 1 ppm. ammonia, 1 to 15 ppm. of nitrates and 15 to 102 ppm. of sulfate. The iron content varied from 0.2 to 6 ppm.

The hardness and alkalinity of the samples from each formation were far from distinctive, varying from 200 to 400 ppm. and 300 to 450 ppm., respectively, for Sankoty water. For the Wisconsin and outwash waters, the hardness varied from 300 to 600 ppm. and the alkalinity from 200 to 500 ppm. Neither the hardness-alkalinity nor the calcium-magnesium ratio was consistently distinctive for waters from any formation.

Illinois River

Another factor considered was the quality of the Illinois River water. There is a dam across the narrow channel of the river south of the industrial district, which maintains a minimum level of 440 ft. msl. in the river and in Lake Peoria. The quality of the river water (minimum flow 4,000 cfs.) is influenced not by the pool level but by the total flow and by the proportion of the total flow which originated as diversion from Lake Michigan and sewage from Chicago (average 3,000 cfs.).

The mineral quality of the Illinois River water is characterized by its hardness-sulfate ratio. In general, the hardness (as $CaCO_3$) varies linearly with the sulfate concentration (SO_4- -). The total hardness varies from 182 to 352 ppm., the total mineral content from 196 to 443 ppm., and the chlorides from 7 to 30 ppm. The nitrate content is less than 15 ppm. The sulfate-hardness characteristic of the Illinois River water is distinctively different from that of Farm Creek water (Fig. 1) and from any of the ground waters in the area.

Method of Approach

It became evident early in the investigation that each well or group of wells in a particular field required a study separate from the others. Each was influenced by local geological conditions and pumpage.

The greatest variations in analyses of samples from individual wells were in the sulfate and hardness concentrations. It was found that the relative concentrations of these two constituents served as excellent bases for interpretation. Variations were also noted in the temperature and in the alkalinity of the water from some wells. The alkalinity variations support the conclusion that there is some infiltration of river water into the

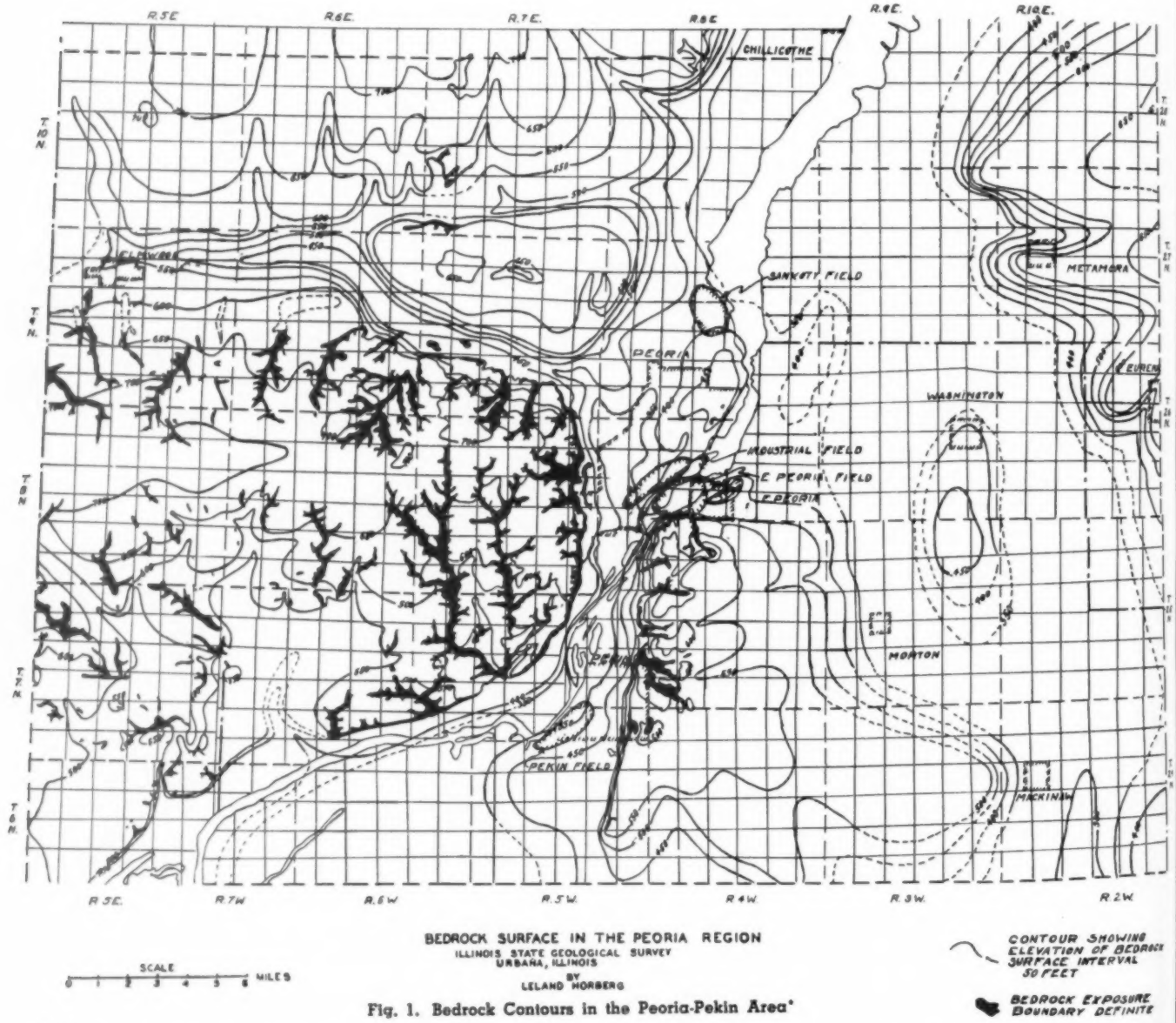

Fig. 1. Bedrock Contours in the Peoria-Pekin Area*

*Data obtained from Reference (2) and from an Ill. State Geological Survey Bulletin and an Ill. State Water Survey Bulletin, both of which were issued in 1948.

water-bearing gravel. Estimates of the sources of the water at any well are based on the general character of the waters, as exemplified graphically by patterns showing the hardness-sulfate relationships, rather than on the month-to-month variations. This procedure is necessary because of the rapid changes that have been found to take place from day to day and even from hour to hour.

Pekin Field

The Pekin Field is located on the east side of the Illinois River, south of Peoria and downstream from the dam. It includes the Pekin city wells and the industrial wells southwest of Pekin. The water quality patterns of several of these wells and the three possible sources are shown in Fig. 2. It is apparent that the quality from each well varies considerably. In view of the character identifications discussed so far, two interpretations are possible. First, it may be reasoned that the patterns represent mixtures of Wisconsin drift water and Sankoty water with a small quantity of Illinois River water. If this explanation were correct, however, each pattern should be confined within a narrow band limited by the hypothetical mixtures of these two waters. Actually, the hard-

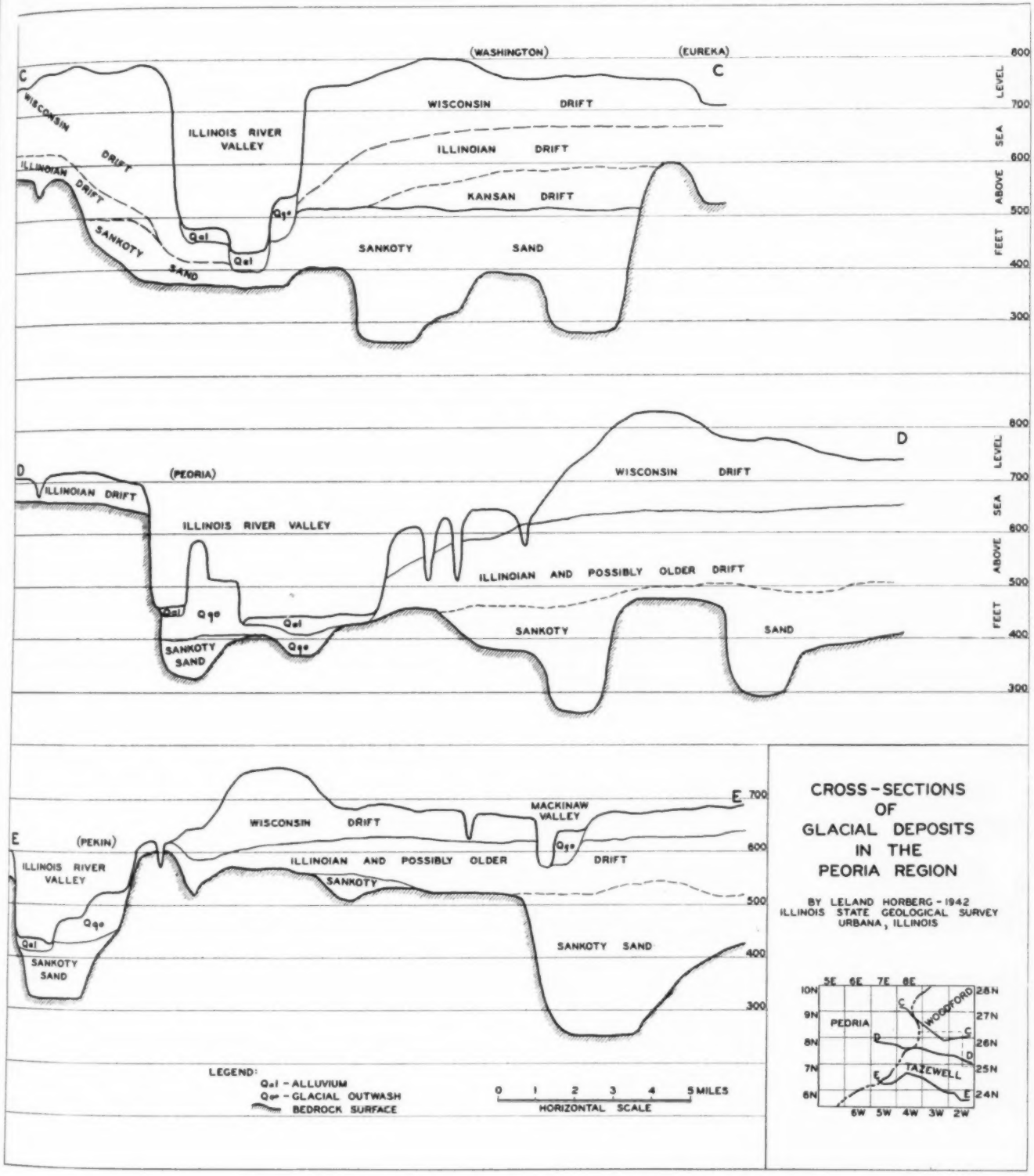

Fig. 2. Cross-sections of Glacial Deposits in the Peoria-Pekin Area*

*Data obtained from Reference (2) and from an Ill. State Geological Survey Bulletin and an Ill. State Water Survey Bulletin, both of which were issued in 1948.

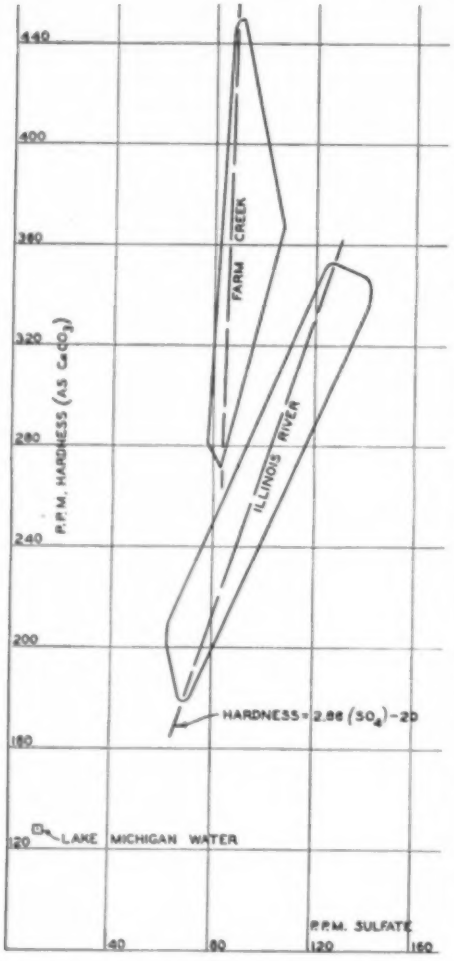

Fig. 3. Relative Character of Illinois River and Farm Creek Waters

(Straight lines represent the general character as given by mass of specific points.)

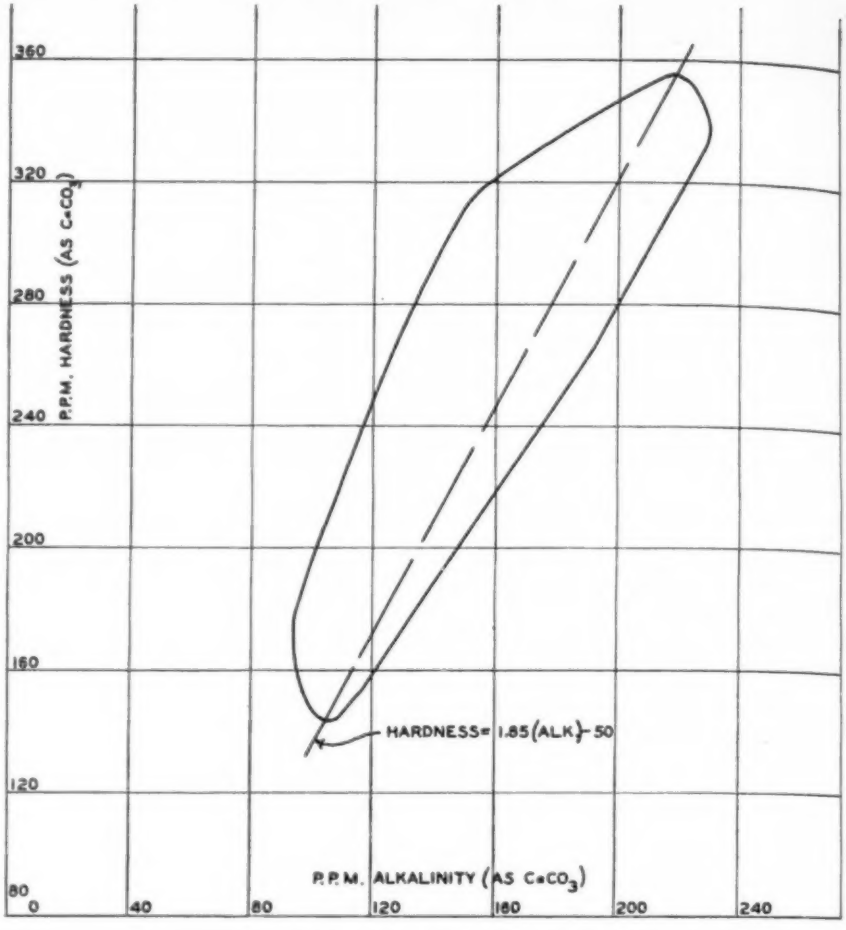

Fig. 4. Character of Illinois River Water

(Straight line represents the general character as given by mass of specific points.)

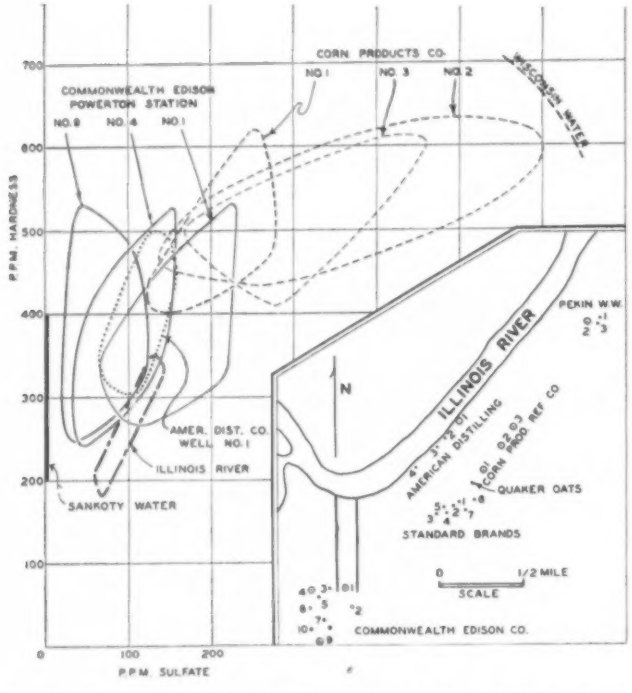

Fig. 5. Character Patterns of Waters from Industrial Wells South of Pekin

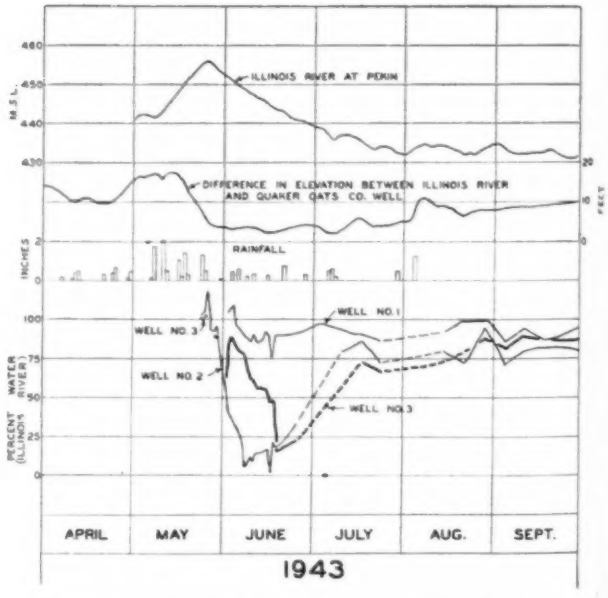

Fig. 6. Calculated Per Cent of Illinois River Water Entering Corn Products Co. Wells No. 1, 2, and 3

(After heavy rains and floods in 1943)

ness variations overhang the band on both sides, indicating the presence of a considerable proportion of water from other sources. In addition, several tests have shown that the saturation index of Sankoty water is positive, indicating calcium carbonate saturation. These considerations indicate that the Pekin Field derives water from a third source. Again, waters from the Sankoty formation invariably contain more than 1 ppm. of iron, whereas no indication of iron has been given in the analyses of the water from these wells. Only 4 of 72 samples from the American Distilling Co. well contained more than 0.1 ppm. of iron.

The Illinois River is a third possible source of water. Since this water has a negative saturation index, it could readily dissolve additional calcium and magnesium.

Compared to the solubility of dolomite, all other salts of calcium and magnesium, as well as all sodium and potassium salts, are very soluble. It was therefore assumed that over a long period of time practically all of the soluble salts in the ground formation under and near the river were leached out, whereas much of the relatively insoluble dolomite still remains. It was then postulated that, if Illinois River water entered the ground, its chemical character would be altered only by the solution of dolomite, thereby increasing the hardness and alkalinity by equal but unpredictable amounts.

For this reason, the pattern for the Commonwealth Edison Powerton Station Well No. 9 (Fig. 5) is interpreted to represent mixtures of Sankoty water (containing no sulfate) with Illinois River water (altered by an increase in hardness) and possibly some Wisconsin or outwash water.

The patterns for the Powerton Station Wells No. 4 and 1, and the Corn Products Co. Wells No. 1, 3 and 2 are interpreted to show these waters to be predominantly mixtures, containing progressively greater proportions of Wisconsin or outwash waters with water of Illinois River origin. Further consideration of the relative location of these wells with respect to the Illinois River and to the channels to the Powerton Station, and of the relative pumpage from these wells and other wells in the immediate district, confirms and explains the interpretation of the analytical data.

In 1943, during and after a severe flood, the Corn Products Co. made frequent analyses of samples of water from their wells. At no time were analyses found to be identical in quality or character to Illinois River water, but with the aid of the assumptions concerning the possible alteration of river water quality, an equation was developed to indicate the proportion of water coming from the river in each sample (Fig. 6).

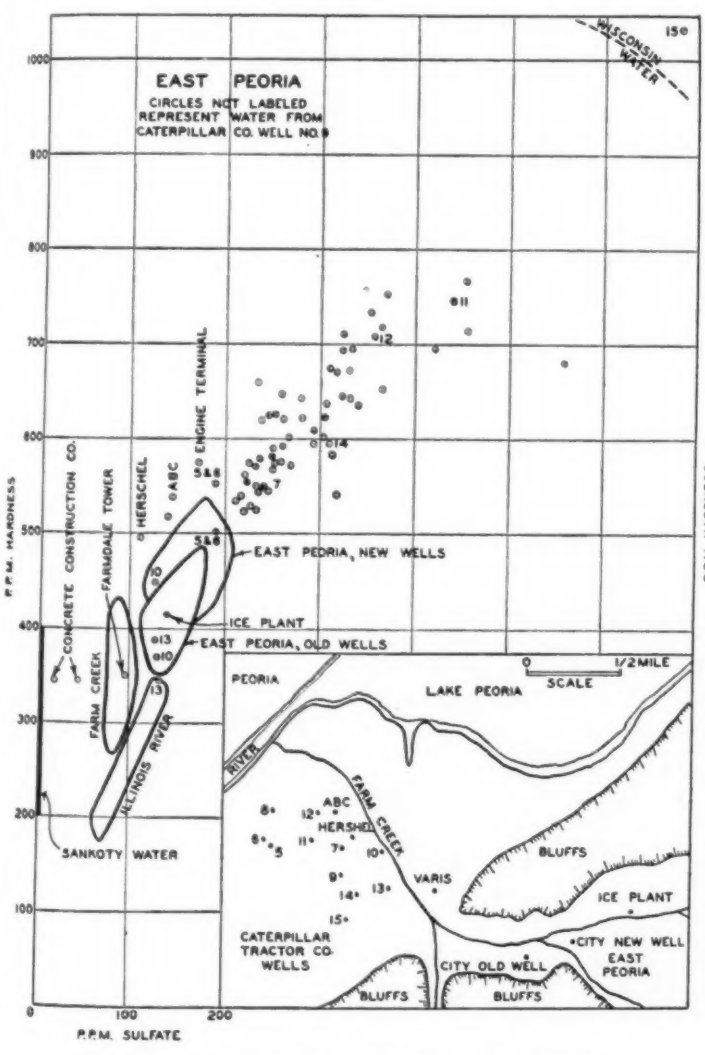

Fig. 7. Character Pattern of Wells in East Peoria
(Circles not labeled represent water from Caterpillar Co. Well No. 9)

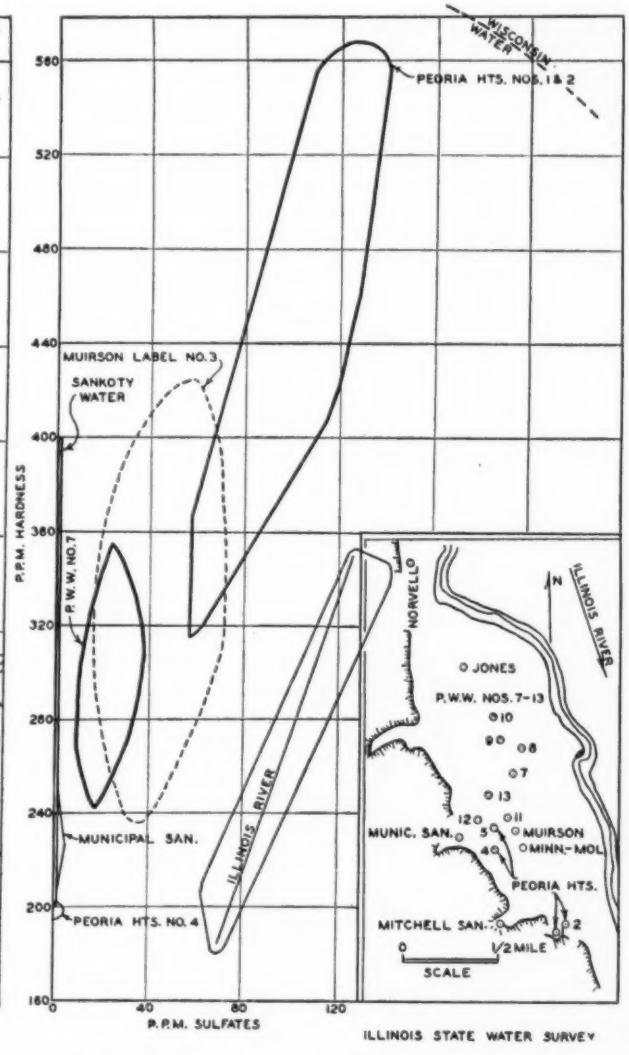

Fig. 8. Character Patterns of Wells in Sankoty Field.

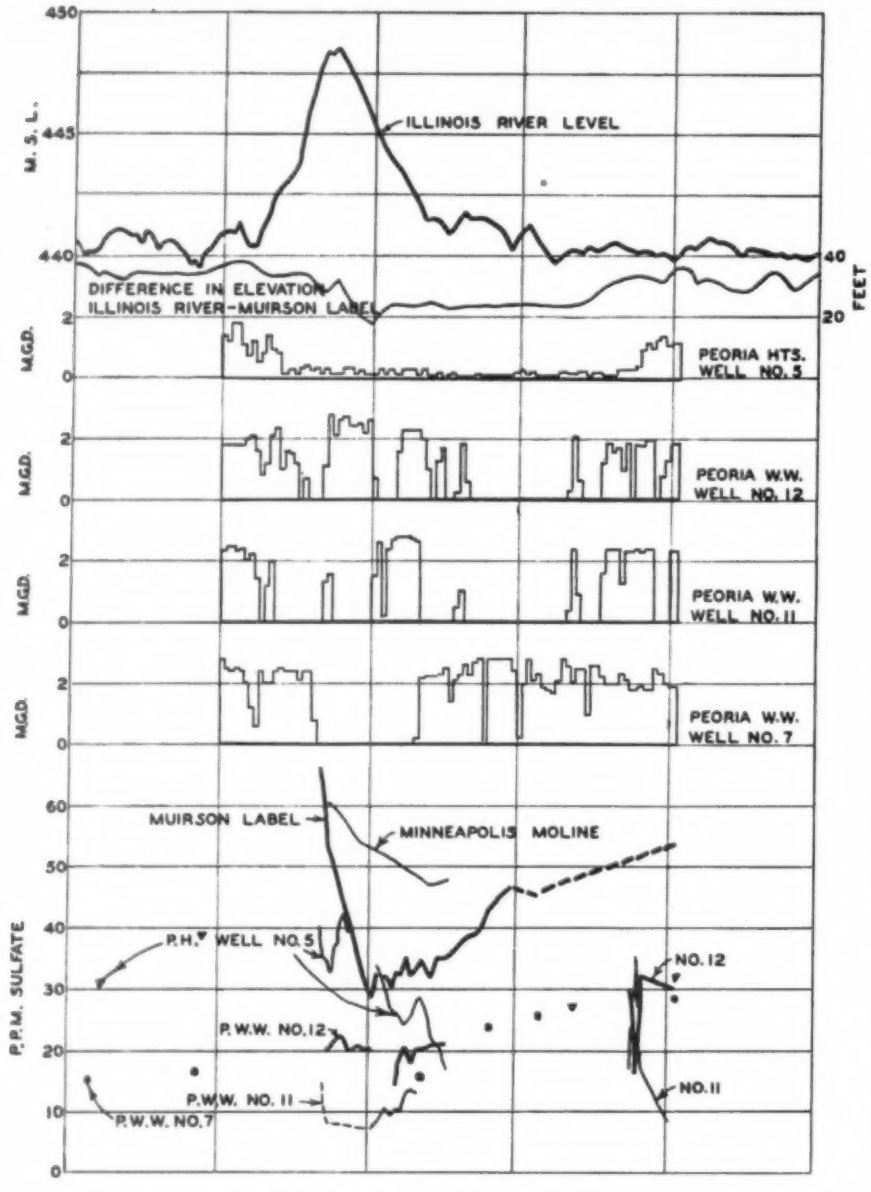

Fig. 9. Sampling Data from Sankoty Field

The character of Illinois River water was defined by the general relationship between the hardness and sulfate content and the hardness and alkalinity (Fig. 3, 4).

$$\text{Hardness} = 2.86(SO_4) - 20$$
$$\text{Hardness} = 1.85(\text{Alky.}) - 50$$
$$\text{Alkalinity} = 1.55(SO_4) + 16$$

On passing through the ground toward the well, this water would dissolve some dolomite and thereby increase in hardness and alkalinity by Z ppm., but the sulfate content would be unaltered. If the sulfate, alkalinity and hardness of the transferred and altered river water are called A, B and C respectively, then:

$$A = SO_4$$
$$B = \text{Alkalinity} + Z$$
$$C = \text{Hardness} + Z$$

and:

$$B = 1.55A + 16 + [C - (2.86A - 20)] = 36 + C - 1.31A$$

If the ground water quality is arbitrarily exemplified by the analysis showing the greatest hardness and sulfate content, then the per cent x of river water in any sample can be calculated from the sulfate, alkalinity and hardness of any particular sample. The ground water is characterized by a hardness of 610 ppm., an alkalinity of 325 ppm. and a sulfate content of 600 ppm.

$$100\ SO_4 = xA + (100 - x)600$$
$$100\ \text{Alky} = xB + (100 - x)325$$
$$100\ \text{Hdns} = xC + (100 - x)610$$
$$B = 36 + C - 1.31A$$
$$x = 100\ \frac{500 + \text{Hdns} - \text{Alky} - 1.31\ SO_4}{464}$$

For the purposes of illustration, Table I has been prepared to show the data used for the calculation of the per cent of river water obtained from the Corn Products Refining Co. wells on June 10, 1943.

The assumption of a definite point value for ground water and of a straight-line relationship for hardness-sulfate and hardness-alkalinity for river water are actually rough approximations and involve a maximum possible error of about 50 per cent, but it was found that reasonable deviations from these ground water values and river character relationships did not alter the *trend* of the results shown in Fig. 6.

Table I

Well	Sulfate	Alkalinity	Hardness	River Water
	ppm.	ppm.	ppm.	per cent
1	213	281	465	87
2	551	336	585	6
3	348	292	525	60

The data show that the heavy rain accompanying the flood period recharged the ground water supply and permitted a high percentage of ground water to be pumped from the wells for about a month after the flood period. This was followed by a return to character indicative of river water origin. This set of interpretations is typical of the approach at the other well fields.

East Peoria

In East Peoria, the city wells are located between Farm Creek and a small branch tributary. It is evident from Fig. 7 that a large percentage of the water obtained from these wells is indirectly from Farm Creek. The old wells appear to contain a greater concentration of water from Farm Creek than the new wells. The temperature of the water from these city wells of 25-ft. depth varies seasonally from 46° to 63°F.

At the Caterpillar Tractor Co., considerable variation in quality occurs from one well to another. Figure 7 shows the general character of the water obtained from Well No. 9 over a period of five years and from each of the other wells on two specific dates. It appears that exceptionally high sulfate water is obtained from the Wisconsin drift at the bluffs to the south, as exemplified by the character of the water at the Caterpillar Well No. 15.

Sankoty Field

In the Sankoty field located north of Peoria Heights about three miles north of the Main Pumping Station of the Peoria Water Works Co., the quantity of water extracted for the city supply is such that approximately three months' pumping would completely dewater the formation in the

immediate area of the wells in this field, if there were no water entering from surrounding areas and no recharge.

The Muirson Label Co. Well No. 3 (Fig. 8) shows a considerable variation in quality because of its proximity to all three of the recharge or inflow sources. The pumpage from this well (0.1 mgd.) and from the Minneapolis-Moline Co. well (0.001 mgd.) is low, but the quality is greatly influenced by the pumpage in the nearby heavy producing area.

Peoria Water Works Well No. 7, which is perhaps at the center of the greatest amount of extraction (Fig. 6), also appears to be centered in the ranges of quality obtained from the three sources. The quality appears to be predominantly on the side of typical Sankoty water (zero sulfate) rather than on the side of Wisconsin drift or the Illinois River water. The temperature is predominantly about 54°F., but occasionally varies to 53° and 58°F.

The quality of the water from each of the wells varies considerably and at this field no clear interpretation could be made. Here again, however, the variations in quality for each particular well are limited to a specific or characteristic pattern of sulfate and hardness concentrations. Typical patterns for the waters obtained in the field are compared with possible recharge waters.

The qualities of these waters vary from that of typical original Sankoty formation water, such as that found in Peoria Heights Well No. 4 and in the Peoria Municipal Sanitarium well (located near the buried valley northwest of Peoria), to that of the Illinois River, which is shown to have an appreciable sulfate concentration. In general, the hardness and the sulfate concentrations are not as great as those found in certain samples from Peoria Heights Wells No. 1 and 2 at the bluffs on the south side of the heavy producing area. These wells, by virtue of their proximity to the bluffs, often appear to obtain a considerable proportion of Wisconsin drift water of relatively high hardness and sulfate.

It appears that water enters the heavy producing area of the Sankoty Field (Peoria Heights Well No. 5, Peoria Water Works Wells No. 7, 9, 10, 11, 12 and 13) from the Wisconsin drift, the underlying Sankoty sand and possibly the Illinois River.

An attempt was made to obtain further information by daily sampling of wells in this field in June 1945. The data collected are shown in Fig. 9. Unfortunately, the operation of the wells at this time did not permit sufficient sampling to establish any definite conclusions other than that considerable variation in quality occurs from day to day.

Industrial Field

In the industrial field, the records of analyses determined by Hiram Walker & Sons, are interpreted to show that much of the water obtained from the No. 2 Well, which is closest to the river (Fig. 10) was derived indirectly from the river (solid-line pattern) and that only after the high rainfall periods in 1942 and 1943 was an appreciable amount of ground water (high sulfate) obtained (extended broken-line pattern) at this well.

In this well field, the relative patterns of water character from several wells indicate the sources of water obtained from these wells. These patterns show that:

1. The Hiram Walker Well No. 2 obtains much of its water from the river, whereas No. 7, which is farther from the river, constantly yields water of a greater sulfate content.

2. The Schwab Dairy and the new Dodge Street Well waters are almost identical, and by virtue of a high nitrate content these, incidentally, appear largely typical in character of waters from the glacial outwash from the northwest.

3. The Sanitary District well, which is closer to the river, yields water of lower sulfates, indicating a large proportion of its source to be from the river.

4. Spot samples at other wells indicate that more river water is present, as the location of these wells is closer to the river. Of corresponding

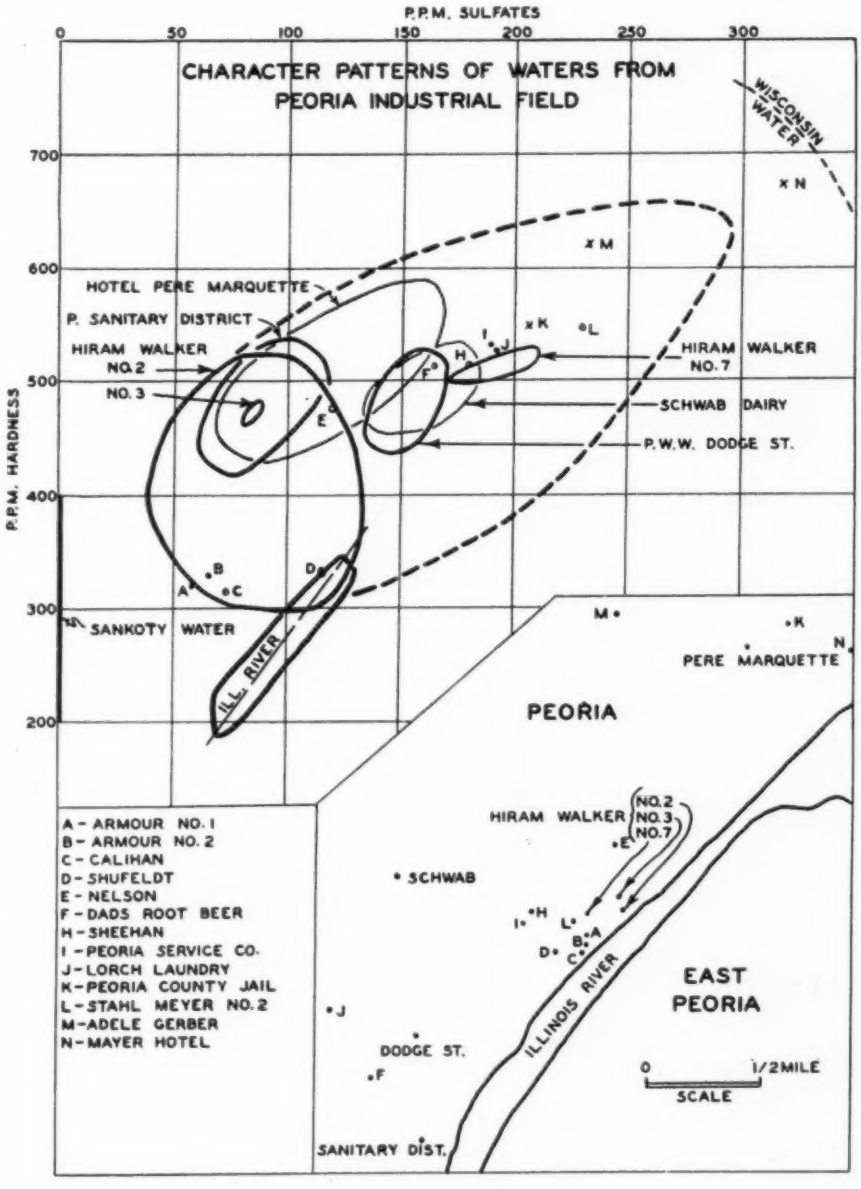

Fig. 10. Character Patterns of Wells in Peoria Industrial Field

interest is the fact that the wells showing a high percentage of river water are not the heavy producing wells in this field.

Some question has been raised concerning the extent to which river water may enter the ground water formations. This question is based on the fact that the river bottom above the dam is covered with a silt deposit estimated to average 10 ft. in thickness and found to have a maximum recorded thickness of 25 ft. It is conceivable that this silt deposit, having only about 12 per cent water content, may act as a relatively impervious barrier to the transfer of river water. The interpretations do not indicate where or how river water enters the ground at each field, but do indicate that it does to a variable extent, depending on the location of the well.

It is estimated that 34 per cent of the over-all estimated pumpage of the area, exclusive of Sankoty Field, is of river origin. The 11 mgd. pumped in the Pekin Field below the dam derives some 73 per cent of its water from the river. Of the 37 mgd. pumped in the Peoria Industrial and the East Peoria fields, only 14 per cent is estimated to be of river origin, and 10 of the 14 per cent is estimated to come from Farm Creek. No estimate is made on the percentage at Sankoty Field.

As a whole, the study has been highly interesting. The data serve as additional bases for hydrologic interpretations and to supplement the hydrologic conclusions.

Acknowledgment

The author wishes to express his appreciation to the various members of the Illinois State Water Survey staff who have co-operated and contributed constructive criticisms during the preparation of this report.

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2. Horberg, L. Groundwater Geology of the Peoria Region. Illinois State Geological Survey, Urbana, Ill. (1946).

Southwest Sect. A.W.W.A. Honors Name of Egmont Smith

The Southwest Section of A.W.W.A. in convention at Galveston in October created the Egmont S. Smith Memorial Scholarship Fund. The administration of the fund was placed in the hands of the Publication Committee, and a non-profit corporation for educational purposes was set up to safeguard the perpetual character of the fund.

Contributions are solicited and to date nearly $3,000 have been turned over to the Committee. It is hoped that a minimum of $15,000 will be raised. It is anticipated that the first award to a student attending college can be made in 1949-50.

International Joint Comission Completes Field Works at Detroit

The International Joint Commission on Boundary Waters has announced the conclusion of the field works in the Detroit area. The technical advisory board met recently at Windsor and reviewed the work accomplished since the survey began in the summer of 1946.

The Detroit area study involves the St. Clair River, Lake St. Clair, the Detroit River, and tributaries flowing into these bodies.

The field parties of the U. S. and Canadian sections collected 12,000 samples and made 60,551 chemical determinations and 9,505 bacteriological analyses.

Hearings on pollution abatement in this area took place November 15 and 16 for the American side, and on November 17, 18, 19 for the Canadian industries.

The International Joint Commission is now studying the boundary waters in the Lake Erie to Lake Ontario region on the Niagara River and its tributaries.

Raymond F. Goudey Succumbs to Heart Attack

Raymond F. Goudey, Consulting Engineer of Los Angeles, Calif., succumbed to a heart attack suffered on December 17th at his home. Prior to this sudden fatal attack he had been in the best of health.

Raymond Freeman Goudey

Mr. Goudey, born Jan. 4, 1894, in Everett, Mass., was graduated by the Mass. Institute of Technology in 1917 and received an M.S. degree from the University of Southern California in 1936. He came to California in 1917 as Ass't. Eng'r. of the State Health Dep't., which he served in various capacities until 1929. During World War I he served in 1918 and 1919 as 2nd Lt. in the Sanitary Corps of the U.S. Army.

In 1930 he became associated with the Los Angeles Dep't. of Water and Power on special projects, amongst which was the operation of an experimental sewage treatment plant, looking toward the practicability of high degree purification of Los Angeles sewage and its return to the ground water supply by spreading. He also engineered the development of automatic water chlorination by the residual chlorine process of chlorine feed control in which the residual tests were mechanically made at set intervals. He developed an economical and more efficient method of reservoir treatment for algae control by mechanical reservoir surface dusting with powdered copper sulphate.

Serving the Los Angeles Dep't. of Water Supply as Chief Sanitary Engineer and Director of Laboratories until June, 1947, he became associated with the Truesdail Laboratories in April, 1948, and in November, 1948, established his own office and sanitary engineering laboratory in Los Angeles.

Mr. Goudey, a past-director of the Am. Water Works Ass'n., was a past-chairman and Fuller Awardee of the California Section. In 1942 he was winner of the Goodell Prize for the outstanding paper of 1941 published in the *A.W.W.A. Journal*. He served on a number of important committees in A.W.W.A. and was a member of the Executive Committee of the Sanitary Engineering Division of the Am. Soc. of Civil Engrs. He was a valued member of numerous associations such as the Federation of Sewage Works Assn's.; the A.P.H.A.; the Am. Chemical Soc.; and was voted Life Membership in the Arizona Sewerage & Water Works Assn. in recognition of his technical contributions. He contributed a number of papers to the technical literature and was a valued contributor to this magazine which will genuinely feel the loss of this able Sanitary Engineer.

COMPRESSED AIR POWER FOUND IDEAL IN HYDRANT AND VALVE MANUFACTURE

by
E. C. POWERS
Educational Director
COMPRESSED AIR AND GAS INSTITUTE
CLEVELAND, OHIO

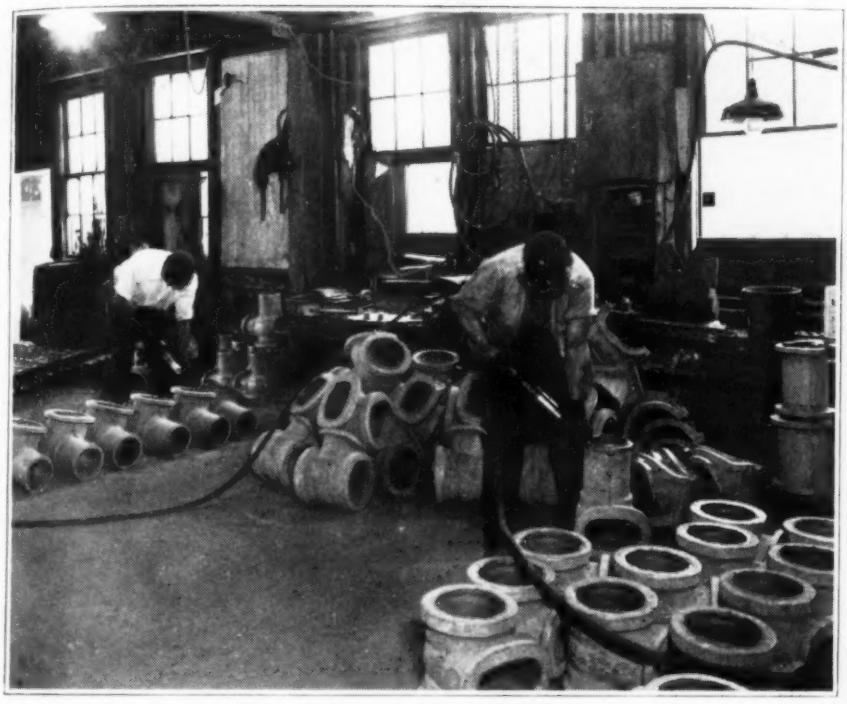


Fig. 1—Air-powered Chipping Hammer in Use in the Foundry.

THE A. P. Smith Mfg. Co. of East Orange, N. J., has found that the use of compressed air is of considerable help in many of their manufacturing operations. This firm is engaged in producing equipment for use in water works installations. Products include iron and bronze valves through 66-inch size, hydrants, and machines used to make branch connections and to insert valves in water mains under pressure.

Due to its flexibility and ruggedness, compressed air is employed in practically every part of the plant and for a great variety of uses. Starting at the boiler rooms, air is used for soot blowing on the two high pressure and four low pressure boilers that produce steam for power and heating.

In the pattern shop, air is used for blowing chips from machines, operating portable tools, and mixed with gas, for heating soldering iron gas plates.

The brass foundry employs air mixed with No. 2 oil to operate the four melting furnaces, the "Meltomat," and a ladle heater. Here, air is also used for blowing chips from machines and for removing dust from molds, for the operation of two molding machines and seven of other makes, as well as a jolt machine. In addition, it is used to form molding cores on a Demmler core machine, and for operating chipping hammers.

In the Foundry

In the iron foundry compressed air is put to similar use. It is employed to power air rammers, used on molds and cores, for knocking out molds, and for chipping surplus metal from castings, as shown in Fig. 1. It is also used for operating a rod straightening and cutting machine, for cleaning chips and dust from a number of machines and other surfaces, for operating a draw and

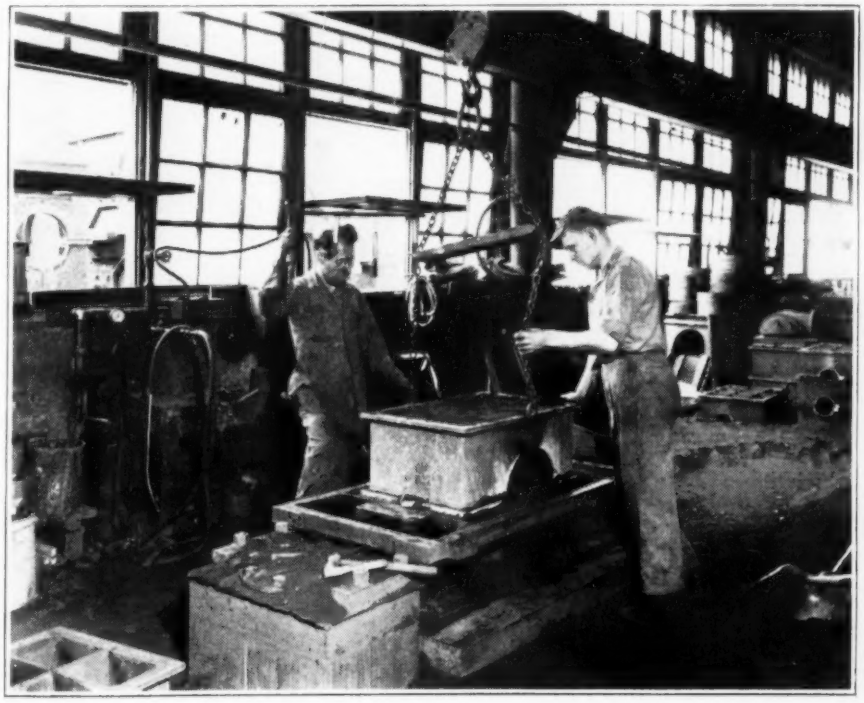


Fig. 2—Moulding Machine Operated by Compressed Air.

*Data and photos for this article were obtained by the Compressed Air and Gas Institute through the courtesy of The A. P. Smith Mfg. Co.—The Author.

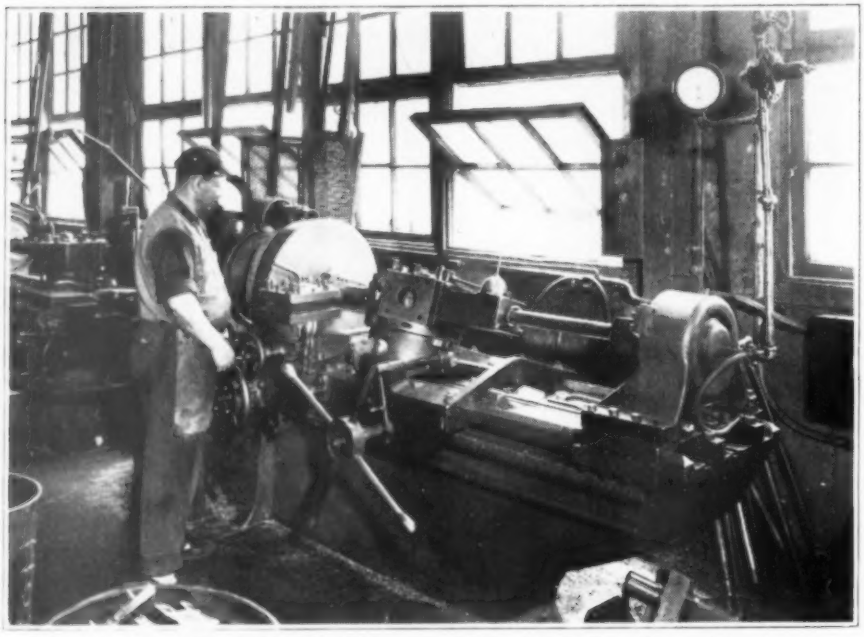


Fig. 3—Lathe Equipped with Air-powered Ram for Rolling Bronze Disc-rings.

bump molding machine, and other types of molding machines, including the type shown in Fig. 2.

The skin drying of molds is done with foundry blow lamps, and air mixed with No. 2 oil is used to operate the burners of these lamps. A number of portable air grinders are also in use for various foundry grinding operations.

In the brass finishing department air and gas are employed to operate the gas plates for heating soldering irons and several hand screw machines are equipped with air chucks for the speedy and efficient chucking of work to be machined.

In the Machine Shop

The machine shop is well equipped with a number of modern metal working machines, some of them utilizing air for more efficient operation. A lathe is equipped with an air chuck, and a Gisholt turret lathe is provided with an air-powered ram for rolling bronze disc rings into iron valve operating discs, as shown in Fig. 3. After rolling, which forces the metal into a double V-shaped groove in the iron and thus locks it securely in place, the ring is turned down with a regular lathe tool to give it a smoothly machined surface, which is so important in valves and hydrants.

A number of hand screw machines are equipped with air chucks, and air powers the work table of a drill press. Air is also employed to operate a hoist for handling work while it is being prepared for machining.

To secure nozzles in hydrant bodies, lead is melted in a furnace using air and gas and poured around the nozzles. The lead, after hardening, is then caulked with an air-powered caulking gun.

Other uses of compressed air in the machine shop include blowing chips from machines, operating portable air-powered grinders, pneumatic and hydraulic testing machines, and impact wrenches used for bolting large valve parts, as shown in Fig. 4.

In all, this plant operates eight air-powered molding machines in its iron foundry, nine such machines in the brass foundry, twelve machines throughout the plant equipped with air chucks, and fifty portable air-powered tools of various applications.

Pressure Air System

To furnish air for these many applications two steam driven compound air compressors are operated. One has a capacity of 780 cubic feet per minute. This machine is pictured in Fig. 5. The other compressor has a capacity of 590 cubic feet. Both compress air to 90 pounds pressure.

Fig. 4—Air-powered Impact Wrench Used to Assemble Valve Parts.

Air from these compressors is piped to three large receivers located outside the building, and from here it is distributed to the various shops where it is used. At strategic locations throughout the plant, smaller receivers serve as reservoirs to prevent undue drop of line pressure due to large demands of air by certain machines.

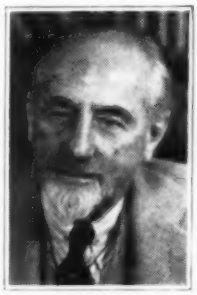
Within the past year, this plant has installed new air distribution lines throughout its machine shop and iron foundry. A feature of this new system is the location of a number of air manifolds on the steel building columns. These are equipped with air connections which permit quick attachment and detachment of various portable air-powered tools. The convenient location of these air manifolds greatly increases the flexibility of the compressed air distribution system, since tools can be quickly put in service at any required location throughout these busy shops.

The A. P. Smith Mfg. Co., of East Orange, N. J., is a leading producer of equipment used in waterworks systems, having a long record of successful undertakings in the water supply field. This company not only believes that compressed air is an ideal form of power in its shops but also for the field operation of certain of its products. The machines it furnishes for cutting water and gas lines for the installation of shut-off valves or branch connections in mains under pressure are equipped to be powered by portable air tools if desired.

JOHN V. N. DORR MOVES TO CHAIRMANSHIP OF THE DORRCO BOARD

Elmer R. Ramsey Succeeds to Presidency

DR. JOHN V. N. DORR, long a figure of importance in the field of sanitary engineering as well as mining and metallurgy, became Chairman of the Board of the



Dr. J. V. N. Dorr

Dorr Co. on Jan. 20, and Elmer R. Ramsey, Operating Vice President of the company, succeeded to the office of President. In making the change Dr. Dorr said, "As many of my friends and professional associates know, I have for some time been looking forward to the time when I could move up into the Chairmanship of the Board of our company and leave to my successor in the Presidency the bulk of the administrative details associated with the active personal direction of an international engineering enterprise of not inconsiderable size and complexity. . . .

"This will enable me to devote more time to studying and guiding future developments of the company, while seeing that its management is carried on by all concerned with a maximum delegation of authority and maximum encouragement of individual initiative. . . .

"This present step . . . . is another in the company's expansion and development, and expresses the confidence I have in the ability of those who have been associated with me for years to carry increased responsibilities . . . . "

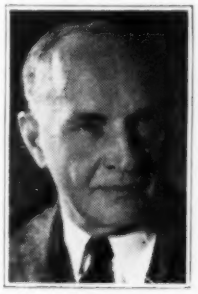
Dr. John Van Nostrand Dorr has been noted not only for his inventions and engineering applications in the field of sanitary engineering but also in the fields of chemistry, and metallurgy. He has been a successful business administrator and prolific inventor of machines and processes. His own 26 inventions, notably the Dorr Classifier, the Dorr Thickener and Dorr Agitators or modifications, supplemented by those of his staff, have been successfully used in more than 100 separate and distinct processing industries.

Born in 1872 in Newark, N. J., Dr. Dorr entered the Thos. A. Edison Laboratory at the age of 16. Following two years with Edison he attended Rutgers where he graduated in 1894. From 1895-1901 Dr. Dorr worked on various mining properties in the west and then worked his own properties until 1913. In 1910 the original Dorr Co. was formed as the Dorr Cyanide Machinery Co., and changed to the Dorr Co. in 1916.

In addition to the manufacture of mining, metallurgical and sanitary engineering equipment, Dr. Dorr early went into research with the Westport Mill, Westport, Conn.

Dr. Dorr has been honored many times for his achievements in engineering fields: In 1916, the John Scott Medal of Franklin Institute; in 1930, the James Douglas Medal of the Amer. Inst. of Min. and Met. Engrs.; in 1938 the Chemical Industry Medal of the Society of The Chemical Industry; in 1940, the Modern Pioneers Award of the National Assn. of Manufacturers; in 1940 the Perkin Medal of five great chemical societies of America.

Dr. Dorr has also received academic recognition for his work, including a D.Sc. from Rutgers University, a D. Eng. from the South Dak. School of Mines, and also from



E. R. Ramsey

the Michigan College of Mining and Technology, and a D.Sc. from Columbia University. He is the author of numerous technical articles and a book on gold and silver mining. A report on his recent trip to Europe will soon appear in *Water & Sewage Works.*

Elmer R. Ramsey, who succeeds Dr. Dorr as President of the company, has been a member of the Dorr Co. for almost 35 years, longer than any other staff member except Dr. Dorr.

Born in London, Ky., in 1888, and a graduate of the Colorado School of Mines in 1912, Mr. Ramsey joined Dr. Dorr to work in the Lundberg, Dorr, and Wilson Mill in Terry, S. Dak., in 1912, and in 1913 he became a junior engineer for the company in Denver.

In his current advancement to the position of President of the Dorr Co., Mr. Ramsey was the unanimous choice of his fellow staff members. He is a member of the Amer. Inst. of Min. and Met. Engrs., and the Min. and Met. Society of Amer.

N.E.W.W.A's DECEMBER MEETING

Features "The Case for Water-witching", Thawing Methods and Corrosion Control With "Calgon"

THE NEW England Water Works Assn. held its December meeting in Boston on the 16th. As has been the custom for the past several years, the opening hour was devoted to "The Water Works School," which comprises a series of lectures on Elementary Practical Hydraulics given by Professor Allan T. Gifford of the Mass. Institute of Technology. The subject this month was the ever important and intriguing problem of "Divided Flow," in which Prof. Gifford explained the data required and formulae used in determining the ratio of flows into or out of two or more reservoirs or tanks connected through individual pipe lines to a common supply main. He demonstrated the steps in the so-called trial and error method of determining the relationship of one distribution reservoir or tank system to another, when both are fed from a supply line from a storage reservoir some distance from the community.

The meeting then split into two discussion groups—The Superintendents' Round Table and The Chemists' Round Table.

SUPTS'. ROUND TABLE*

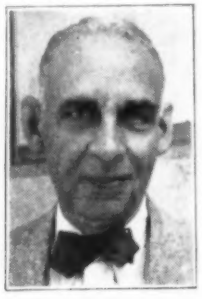
Chairman—Philip Welch
Supt. Public Works, Reading, Mass.

Chairman Welch introduced Fred Austin, Electrical Engr. of Manchester, N.H., who gave a demonstration from a model and spoke on **"The Hazards of Thawing Water Pipes with Electricity."**

Mr. Austin used a model on a board about 3 x 5 ft., representing a cross section of three houses. Electrical circuits were laid out in different colors. Green wires were typical of the water services from the meter out through the water service to the main in the street, connecting the three houses and a hydrant. Black wires were typical of the electric service from the street poles to the leads into the houses, thence through the meter to the usual grounding connection on the water pipes in the cellar.

On a typical frozen service, when thawing by electricity, it is much safer practice, said Mr. Austin, for the operator to disconnect the meter and also to remove ground wires and clamps from the customer's water pipe before attaching the thawing electrode onto the pipe, then to connect the other electrode to the curb box, gate box, hydrant or another customer's service. In the latter case the electrical grounding connection should also be removed from the neighbor's pipe. Current would then be introduced by means of an arc welder or transformer, with the current building up to the desired amperage of 150 amps. or more to thaw the service.

President
Arthur C. King
Taunton, Mass.



Secretary
Joseph C. Knox
Boston, Mass.

Copper services require higher amperage in thawing than do iron pipe services. When the street mains have compound joints, resistances to the current are introduced which result in poor circuits. This will cause the current to follow the path of least resistance and it is thus possible that most of the current will travel out through the electrical system in the house if the grounds are not removed from the water pipe.

In the demonstration conducted by Mr. Austin with his model, when resistances were set up in the pipe line, the ammeter readings revealed the various paths that the electric current took. From these readings it was observed that the electric currents were sometimes actually by-passing the water pipe and travelling out through the electric wires to the street and back through the neighbor's house wiring, thereby creating a hazardous condition which might cause a fire or other damage to the consumer's property.

Some of the superintendents spoke of their experiences in thawing mains and services electrically and it was the consensus of opinion that when thawing by electricity considerable caution must be used. Disconnect the water meter and all known grounds from the water pipe. Keep watch of all house wiring to detect overheating. After the job is completed be certain to put back the grounds on the water pipes.

CHEMISTS' ROUND TABLE

Chairman—Geo. G. Bogren
Chem. Engr., Western & Sampson, Boston.

Chairman Bogren introduced John H. White, Chem. Engr., and New England representative of Calgon, Inc., Pittsburgh, Pa., who presented a comprehensive discussion of the **"Threshold Calgon Treatment for Corrosion Control and Prevention of Red Water."**

In his review Mr. White brought up to date what is known concerning the suppression of attack of aggressive waters on iron pipes by the addition of small quantities of the hexametaphosphate marketed under the trade name "Calgon."

Now with 10 years of history behind its use, Mr. White pointed out that "Calgon" had proved particularly effective in suppressing the type of corrosion observed in connection with very soft waters high in oxygen content. The ideal pH zone for its effectiveness is between pH 5 and 7. Below pH 5 the addition of alkali to boost the pH value had been found of value in reducing the amount of hexametaphosphate required and, thereby, the cost of threshold treatment.

Mr. White pointed out that ordinarily the higher the velocity of flow the greater the corrosion effect in pipe lines; on the contrary with Calgon-treated water the higher the water velocity the greater the suppression of corrosion, explaining the effect as "contact plating," which increases as the water containing the calgon makes increased contact with the pipe walls. Therefore, turbulent flow is desirable. From the same reasoning he pointed out that the greater the thickness of corrosion products on the pipe wall the slower the plating effect on the blanketed true iron or steel of the pipe. Therefore, the advantage of flushing or mechanical cleaning of

*As reported by Roger G. Oakman, Sup't., Needham, Mass.

pipes or mains before introducing threshold treatment.

Another factor of importance in calgonizing is the calcium or magnesium content of the water. The iron content is third in importance. Calgon will not correct corrosivity of distilled water. On the other hand as little as 0.5 ppm. of calcium in any form (even the chloride) will render Calgon effective. Magnesium is almost as effective as calcium. The rule is that for every 2 ppm. of Calgon used there must be not less than 0.5 ppm. of calcium present—i.e. the minimum ratio is 4 Calgon to 1 Ca.

Mr. White then commented on the practical value of calgonizing to prevent waters of appreciable iron or manganese content from turning brown or forming precipitates in pipe lines, heating systems, or staining through film formation on the metal, Mr. White exhibited plated specimens which had a distinct irridescent appearance. To test such film deposition not less than a 20 liter portion of water should be considered and the metal specimen should be kept moving through the treated water to simulate the passing of treated water over the pipe wall surface. The protective film continues protective for about two weeks.

Following his discussion Mr. White was asked many questions in reply to which the following was stated.

In open reservoirs Calgon reverts to the ineffective ortho-phosphate at the rate of 1% each 24 hrs. Calgon will also suppress the precipitation of organic iron compounds if added ahead of chlorine or aeration. In pipe systems not less than 0.5 ppm. of the solution should be a 3% solution although the high solubility of hexametaphosphate makes a 33% solution possible.

Afternoon Session

The afternoon session which followed a characteristically excellent Hotel Statler luncheon was opened with an interesting film on "Industrial New England"—which would have been more interesting if the producers had appreciated the importance of water supply in industry sufficiently to direct attention to this important raw material along with other raw materials emphasized. It all goes to again prove just how commonplace water supply has come to be considered. Water quality in New England has always been an important factor in New England industries, but was

Supts'. Round Table
Philip Welch
Reading, Mass.

Fred Austin
Manchester, N.H.

"Water-Divining"
Lincoln W. Ryder
Boston, Mass.

Chemists' Round Table
Geo. G. Bogren
Boston, Mass.

John H. White
Boston, Mass.

laundry or porcelain fixtures. In the case of well waters containing ferrous iron or manganese the use of Calgon voided the necessity of removing the iron or manganese by expensive methods. To prevent red-water in cold water systems the Calgon dosage need only be twice the iron content. However, to prevent brown discoloration when heating such waters, it is necessary to employ 4 parts of the hexametaphosphate for each part of iron present. A highly important point in such treatment is that the Calgon be introduced ahead of the possible introduction of air or chlorine into the water. Therefore, when treating well waters it is preferable to introduce the Calgon solution into the well proper near the pump suction pipe intake.

Mr. White outlined the simple wire-nail jar test to determine the effectiveness of Calgon and the minimum dosage required. The values of Calgon can quickly be determined at reasonable cost in connection with small systems or on a section of a larger system by actual full scale plant applications. If a pilot plant test is employed the test should not be too small. In discussing the theory of protection hexametaphosphate must be present in the ends of the system for real protection. The reverted ortho-phosphate has no effect.

In the case of copper and brass Calgon has been found effective for most waters. Where the pH is less than 7 it may prove advantageous to use alkali to boost the pH to 7 or higher. It effectively protected water meter. When cleaning a water main some Calgon should be added promptly—in fact 10 lbs. should be introduced immediately behind the cleaning machine. To the flushing water another 10 lbs. should be added and this highly treated water should be allowed to remain in the newly cleaned line for 24 to 48 hrs. Thereafter, the water should be treated with about 10 ppm. of Calgon for a period before reducing to the normal dosage. All of this is for the purpose of laying down the protective film on the raw iron of the cleaned main.

Calgon-feeding equipment can be very simple. A steel drum effectively coated with a coal tar base is a satisfactory solution tank. A rubber hose is satisfactory for conveying the solution. Stainless steel is not affected by Calgon nor is copper tubing. The definitely lost sight of by the producers of this picture.

The first speaker introduced by President Arthur King was Charles E. Knox, Engr. U. S. Geological Survey, Boston, who spoke on **"Drought Runoff in New England."** Mr. Knox presented some interesting statistical data for various New England drainage areas in which it was shown that in northern New England the drought of the summer and fall of 1948 had resulted in the lowest stream flow on record for some streams and the most pronounced for the 6-month period in many years for every northern New England stream.

"The Case for Water-Witching" was presented in an interesting review by Lincoln W. Ryder of Metcalf & Eddy Engrs., Boston.

Concerning this ancient art of water location through use of the divining rod, Mr. Ryder said that the first diviner of record appeared to be Moses who, according to the Bible, struck the rock with a rod and water gushed forth. In the 1600's diviners really flourished and their rods were even christened in churches. Interestingly the best dousers were illiterate men, but dousing was employed by the

French in World War I and the British Army maintains a section of recognized dousers in the Royal Engineers. As recently as in 1932 dousing was given legal status in Italy where in the same year there was held an International Congress of Diviners. The following year another Congress was held in Germany.

Indicative of the position of the water diviner, in 1914 the U.S. Geological Survey published a 60-page brochure on this subject with an appended bibliography of almost 600 references. As recently as 1931 a 308 page book "Water Diviners and Their Methods" by Mager was published in London and more recently (1940) a 450-page book "Physics of the Divining Rod" by Maby and Franklin was also published in London.

Concerning "the rod," Mr. Ryder said that most diviners of modern times prefer witch-hazel, willow, hazel, apple or peach. More modern is the "long magnetized needle, moving on a pivot above a cylindrical mass of soft iron" such as is described by Mager in his book above mentioned.

Interestingly enough, water diviners were employed by the British Army during World War II, and the U.S. Geological Survey continues to receive many inquiries concerning dousing as a means of locating wells. Possibly, aside from his paper, the most recent article is that by Kenneth Roberts in *Life* magazine, October 4, 1948, which reveals the persistency of the faith of many in water-witching divining.

L. H. Enslow commented that if the old saying holds true, that the subject on which the greatest number of articles are found in the literature is that about which the least is known, we can put water-divining and corrosion control in the same category. However, this intriguing subject could not be dismissed too lightly when it continues to have some standing in the British Army. He then recalled some rather famous diviners, and it was not conceivable that one can fool all of the people all of the time. He then admitted that the hazel twig in his hands had no value, but that he had seen a diviner only recently locate a water main—whereupon the meeting was adjourned.

13th ANNUAL CONFERENCE
ILLINOIS SEWAGE TREATMENT WORKS OPERATORS*

The 137 Illinois sewage treatment works operators, who traveled to Springfield for their 13th annual conference on Nov. 16 and 17, enjoyed one of the finest programs that this organization has ever presented. The conference is sponsored by the Illinois Department of Public Health and the Illinois Sanitary Water Board. Officers elected for the ensuing year are:

Chairman
D. R. Miller, Sanitary Engineer
U. S. Naval Training Center,
Great Lakes, Ill.

Vice Chairman
William McMullen, Superintendent,
Sewage Treatment Works
Collinsville, Ill.

Secretary
Reinhold Spiess, Superintendent,
Sewage Treatment Works
Litchfield, Ill.

The Elgin Sanitary District Everett E. Smith Memorial Award Trophy for the best operated Illinois sewage treatment plant was awarded to LAFE DIXON, Supt. Sewage Treatment Works, Dixon. The Bloomington-Normal San. Dist. Harry E. Wilson Memorial Award Trophy for the best maintained Illinois sewage treatment plant and grounds was awarded to REINHOLD (SHORTY) SPIESS, Supt. Sewage Treatment, Litchfield. The DeKalb San. Dist. Fred Simms Memorial Award Trophy for the best operating reports submitted was awarded to WALTER A. SPERRY, Supt. of the Aurora San. Dist., Aurora.

*Report supplied by A. Paul Troemper, Prin. San. Engr., Ill. State Dept. of Health, Springfield, Ill.

The program was opened by C. W. Klassen, Tech. Sec'y., Ill. Sanitary Water Board. One session on ESSENTIALS OF SEWAGE TREATMENT for new operators was presided over by Walter H. Jollie and R. E. Favreau, of the Ill. Sanitary Water Board. A session on "SPECIAL PROBLEMS" was presided over by Raymond E. Anderson, Chief Chemist, North Shore San. Dist., Waukegan. Subjects discussed in this latter session included: Use of DDT for control of filter flies, odor control by use of chloroben, problems which may result from widespread installation of home garbage grinders, explosions in sewer systems, and chlorination of sewage plant effluents.

A panel discussion on "OPERATION AND MAINTENANCE OF SEWAGE PUMPS" was moderated by L. S. Kraus, Chief Chemist, Peoria San. Dist. Participating were Miles Lamb, Chicago Pump Co., R. E. Julian, Anchor Packing Co., and M. P. Schneller, Aurora Pump Co. Particular emphasis was placed on pump packing and packing materials, materials for pump construction to suit various operating conditions, proper placement and selection of pumps, and methods of obtaining maximum service from pumps.

An annual banquet, presided over by S. C. (Sandy) Martin, Exec. Asst., F.S.W.A., had Roy Metz, Supt. Sew. Tr., Carthage, assisted by Mrs. C. C. (Jimmie) Larson at the piano, leading the group singing, and an hilarious skit "Sewage Blackouts of 1948," by C. C. (Swede) Larson, Chief Chemist, Springfield San. Dist., and C. W. Klassen; also a question and answer recording of interviews with a number of the operators, the recordings having been made earlier in the day by the "inquiring sewage reporters."

A panel discussion, "WHAT'S NEW IN SEWAGE TREATMENT," moderated by W. H. (Pete) Wisely, Exec. Secy., F.S.W.A., included A. A. Brensley, Warren & Van Praag, Cons. Engrs.; Dr. F. W. Mohlman, Dir., Div. of Lab., San. Dist. of Chicago; George S. Russell, Russell & Axon, Cons. Engrs.; H. E. Schlenz, Pacific Flush-Tank Co.; Walter A. Sperry, Aurora San. Dist.; J. D. Walker, Walker Process Equip. Co. This discussion was one of the finest ever presented at any of the conferences and covered the Ziegerle process, Kraus process, Okun-Fair process, Hayes process, the Kessiner process, the digester liquor problem, double alternating trickling filters, jet aeration, diffuser tubes constructed of wrapped nylon cord, use of the Cottrell precipitator to reduce suspended matter in air supplied to the activated sludge process, new methods of combatting digester scum problems, external heating of digesters, dual fuel gas engines, cathodic protection of metal equipment in sewage treatment processes, disposal of garbage at sewage treatment plants, particularly digestion of garbage, sale of digester supernatant as fertilizer after reinforcing with liquid ammonia, increasing allowable design loadings on trickling filters, and the economics of allowing production of a lower grade plant effluent where it is discharged to a stream that can take the heavier loading without detriment.

PURCHASING WATER WORKS SUPPLIES AND SERVICES*

by
HOMER A. HUNTER
Consulting Engineer
DALLAS, TEXAS

WATER works officials responsible for analyzing a set of bids often appear to forget that the law enforces acceptance not of the lowest bid, but of the *lowest and best bid*. The best bid may be the highest in dollars and cents but it may easily be the most advantageous to the city because of other factors involved.

Of course, during the last few years, and particularly during the war, most purchases were probably made wherever the materials could be obtained and too little consideration was given to price and quality. To some extent, availability of equipment and materials is still the deciding factor, but when freedom of choice is possible water works men should exercise considerable caution in buying. Under the law they have a great deal of latitude in the selection of materials, supplies and services to be purchased.

The city manager or council may insist on the purchase of the cheapest article, but, if the water works man knows his business as he should, he will be able to demonstrate that the cheapest buy may not be the best one for the city. He has the responsibility for getting on record a recommendation that is best for the city and he will be derelict in his duty if he takes the easy way out and recommends the lowest price every time. Admittedly, it requires some courage to take the more difficult position of proving that the more expensive article is best over the years.

Court Decisions

Most city charters require that the *lowest and best bid* be accepted, and the courts have held that it is not necessary to accept the lowest bid but that of the *lowest responsible bidder*. In the case of *O'Brien* v. *Carney* (6 Fed. Supp. 761) the court stated that "responsibility" means more than a pecuniary ability to perform the conditions of the contract; "it includes also judgment, skill, ability, capacity and integrity." In *Interstate Buick* v. *Philadelphia* (164 Pa. 477) it was held that: " 'Lowest responsible bidder' means not only pecuniary ability

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but judgment and skill, and discretion will not be controlled to prevent an award to a higher bidder." In *Clayton* v. *Taylor* (49 Mo. App. 177) the court ruled: " 'Lowest responsible bidder' means fitness, responsibility or capacity to perform work, and the determination by council that another was not such will not be reviewed."

Federal Regulations

The United States government now recognizes the difference in quality of various articles and Section 245 of the Navy Procurement Regulations reads, in part:

245.1 *Responsible Bidder.* A responsible bidder is a bidder who: (a) is qualified and eligible, by law and under this regulation; and (b) is financially responsible, and able successfully to fulfill the contract requirements.

245.2 *Other Factors to Be Considered.* Other factors besides price that may be considered in making an award are the following: (a) judgment, skill and integrity of a bidder; (b) reputation and experience of a bidder, and prior work of a similar nature done by him; (c) foreseeable costs or delays to the Government resulting from difference in inspection, shipping, location of supplies, etc.; (d) changes made or requested in any of the general or special provisions; (e) restrictions or conditions imposed in the bid; and (f) disadvantages to the Government that might result from making split awards.

Federal Supply Bureau regulations and army procurement regulations also define "responsible" bidders in similar language.

The low-bid procedure used by many city governments in making purchases has placed too great an emphasis on price and has eliminated high quality manufacturers. Often the low bidder proposes to furnish an article difficult to reject under the specifications but lacking intangible elements of top quality which the more able manufacturer can supply. Specifications and even inspection are not complete and adequate quality controls. Specification of design is relatively easy but specification of quality level is almost impossible. For example, proper design and materials may be used in the manufacture of a fire hydrant and it may come up to the standards set by the specification; yet the workmanship and appearance of the hydrant may be well below the desired standard.

Manufacturers' Service Facilities

In making purchases of water works materials and supplies, consideration should also be given to the facilities provided by the manufacturer for servicing the equipment after it is installed. Because many water works items require constant careful operation, periodic servicing is extremely important. If the manufacturer has adequate service facilities, the city may enjoy a considerable saving by not having to keep parts in stock for repairs.

The federal government is placing more and more emphasis on the manufacturer's service facilities. Recently the Veterans' Administration prepared a specification for the purchase of certain X-ray equipment which would eliminate all manufacturers who did not have established repair and maintenance facilities. As a result of complaints by manufacturers to the comptroller general, that official wrote to the Veterans' Administration:

> It has been held consistently by the accounting officers that the determination of governmental needs and drafting of specifications and advertisements therefor are primarily matters of administrative responsibility, and when the specifications reflect actual minimum needs of the Government for a particular purpose, they are not unduly restrictive of competition merely because one or more manufacturers may not be able to meet their requirements. . . . In connection therewith, it is understood that, in view of the nature of the equipment involved, the proper maintenance of such equipment by the successful bidder is of prime importance. . . . Accordingly, you are advised that, if it be determined that only bidders having established repair and maintenance facilities can meet the specific requirements of the Veterans' Administration for the particular equipment here involved,

*This paper, presented before the Southwest Section of A.W.W.A., is here published by permission of the Association.

this office will not be required to object to the insertion of a clause in the invitation for bids excluding all other bidders.

Another item that might likewise be of considerable importance is the location of spare-parts stocks maintained by the manufacturer. It is often necessary to obtain repair parts quickly for certain apparatus and equipment, and stocks of spare parts close by are very comforting.

Hiring Consultants

The purchasing of special services is also of importance in water works operations and should be taken into account. When there is a need for an engineer or other specialist to analyze some particular construction or operating problem encountered, the utmost care should be exercised in the selection of the proper individual for the job. In developing a new water supply or treatment plant or planning additions to the distribution system or the sanitary sewer system, the engineer with the best training and experience should be employed because he will be able to do the most for the least number of dollars spent. The services of a capable engineer can be purchased for about the same amount as those of one less well trained, and there will be no comparison between the character of work done by the two. The operator must live with the works of the engineer, and the better the engineer, the smaller the operating problems will be. Engineers should be selected because of their experience with the particular type of job to be done. The possession of an engineer's license is not sufficient qualification.

Conclusion

Water works men have a great responsibility in purchasing materials, equipment, supplies and services, and they also have the legal right to purchase the best quality available to them. In considering the purchase of such items, it is entirely legitimate for the purchaser to condition the award of the contract on a number of pertinent factors. For materials, supplies, apparatus and equipment, these factors are:

[1] Reliability of operation of similar or identical equipment;

[2] Proven life of the material or equipment;

[3] Probable cost of repair and upkeep;

[4] Speed with which repairs can be made;

[5] Ease of assembly and disassembly;

[6] Availability of repair and maintenance facilities and parts stocks maintained by the manufacturer;

[7] Advantages of standardization of equipment such as meters, valves and fire hydrants; and

[8] Interchangeability of equipment.

For services, the conditioning factors are:

[1] Experience in doing work similar to that contemplated;

[2] Training of individuals involved;

[3] Responsibility and integrity of individual or company;

[4] Experience in other work closely associated with the particular job to be done; and

[5] Facilities available to the individual or company for doing the work.

Eighty-Nine More Indiana Communities to Spend $47,000,000 on Sewage Treatment

Will Result in Only Five Percent of Indiana Sewage Remaining Untreated.

The Stream Pollution Control Board of Indiana plans to ask the 1949 General Assembly for a revision of the Barrett Law to make possible a more satisfactory system of assessments for payment of sewage installations and construction of sewage treatment plants, it was revealed in a recent report detailing the activities of the Board from 1946 through 1948.

The plan stems from the financial condition of small cities and towns, which lack funds or a practicable method of financing sewer and treatment plant installations.

The Board also will ask the General Assembly for an amendment to the Revenue Bond and Sewer Service Charge Act of 1932, to authorize service charges starting with the beginning of construction, rather than after treatment plants are completed. It is believed these requests will be granted.

In its report, the Board has said:

"Although reasonableness has been the theme of the Board's administrative policies, it has issued 87 orders to municipalities and industries since 1943. Sewage from more than 70 per cent of Indiana's urban population is now receiving treatment in 82 municipal plants. Eighty-nine cities and towns are now planning sewage treatment plants or additions estimated to cost approximately $47,000,000. These proposed plants will raise the percentage of urban sewage treated to more than 95 per cent."

In commenting on the report, *The Indianapolis News* has editorialized:

"This Board's legal responsibility is the abatement of stream pollution which brings it directly into contact with cities and towns and with industrial concerns whose wastes constitute one of the continuing sanitary problems. Following the policy of 'reasonableness,' the Board has given plenty of time to establish plants for the treatment of sewage and industrial waste. It has recognized the delays caused by the war and the subsequent increase in construction costs. But it has pressed constantly for compliance with its orders and this pressure is obtaining results."

The report declares the people and the majority of public officials are firmly supporting pollution abatement.—*D. Wimmer.*

"Sewer Plant?—Be on the lookout for a grey battleship; it just went down the drain.—Oh, yes! and thanks for recovering my Uncle Willie's false teeth last week."

Friction Tables

Hydraulic Institute, 90 West St., New York 6, N.Y., has announced the publication of a comprehensive "Tentative Standards on Pipe Friction". The friction loss for water is shown in the new Hydraulic Institute tables in tabular form for pipe sizes from ⅛ in. to 84 in. In addition to the friction tables there is a complete listing of losses in valves and fittings, and a brief review of the basis of the tables. A complete bibliography also is included.

Pipe Friction Tables may be secured for $1.50 per copy from C. C. Rohrbach, Secretary, Hydraulic Institute, 90 West St., New York 6, N.Y.

G. H. Ruston Goes to Roanoke, Va.

Becomes Asst. to Chas. E. Moore

Gilbert H. Ruston, who for the past nine years has been Superintendent of the Water Department of Kenilworth, Ill., resigned this past fall to accept the position of Assistant Manager of the Roanoke, Va., Water Department, where he will be associated with Charles E. Moore.

WHAT IS A SATISFACTORY WATER?

by
A. E. CLARK
Manager
NASHVILLE SUBURBAN UTILITY DISTRICT
NASHVILLE, TENN.

THE duties of the operators of water purification plants, particularly the smaller plants, are many. In addition the consumers look to them personally when there is any trouble, real or fancied.

The discussion which follows applies especially to the small plant operator and his relationship with the general public, as well as his responsibility to the consumers. Although the term "satisfactory" may be more or less relative when applied to water furnished the public, there are a number of conditions which can and should be met by any agency, governmental or private, undertaking to furnish water to a number of consumers.

Supervisory control of public water supplies is exercised by the various State Health Departments which have set up certain standards to be complied with. The health agencies are primarily interested in the condition of the water from the health standpoint; and, due to the vigilance and advice given by the sanitary engineers, the majority of water plant operators realize their responsibility in the production of a biologically safe water. But there are other factors to be considered in order that a water can be judged as satisfactory to the consumer.

The Public Demands More Than Safe Water

The consumer judges a water by its appearance, its taste and/or odor. He usually has little knowledge of the biological qualities and if shown the results of a bacteriological examination of a sample of water collected from his residence, it would mean little if anything to him, but let his pressure decrease considerably or turbid or "rusty" water appear, or a taste and/or odor be discernable, then he makes himself heard—many times in no uncertain terms.

Turbidity does not always originate at the purification plant. A certain amount of sediment accumulates in the mains and as long as the normal velocities are maintained there is no trouble. In the event of a heavy fire draft or a break in a main, wherein it becomes necessary to segregate an area to repair the break, the normal velocities are changed and when the valves are opened on completion of the repairs the accumulated sediment is stirred up, resulting in turbid water

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at residences in the vicinity of the break. Sometimes this is relatively serious, that is, the number of complaints is large and steps must be taken immediately to blow off the mains where necessary to clear up the water. The larger cities usually have a program for blowing off their mains which obviates trouble of the kind referred to in the event of a break. Some of the smaller systems provide fire protection and in this case a program similar to that used in the larger cities can be adopted and in this way keep down complaints. Where fire protection has not been provided every effort should be made to install blow-offs at strategic points on the system and a flushing program set up to keep the system relatively clear of accumulated sediment. Many cities have adopted a plan to install cement lined pipe or a cement asbestos pipe which prevents corrosion and keeps the sediment at a minimum.

Dead Ends, Storage Tanks—and Covered Reservoirs

Dead end mains are a source of trouble in that complaints are generally due to taste and odor. The obvious remedy is to blow off dead end mains at regular intervals and sufficiently often to prevent any complaints, or else to bleed dead ends continuously during the high temperature months.

Except in the relatively few water systems which use direct pumping, some type of storage of the finished water is provided. It may be elevated steel tanks, standpipes or ground level concrete reservoirs. Whatever type of storage is provided requires some supervision. All tank or reservoir vents should be properly screened and manhole covers or other openings for entrance should be fastened securely and preferably locked. Investigations should be made at frequent intervals to check the above. The writer experienced difficulty some years ago with a small public water supply obtained from deep wells without any treatment. The water was stored in an elevated steel tank floating on the system. Noting a relatively large number of bats emerging from the entrance hatch on top of the elevated tank in the early evening was the clue. After replacing the hatch cover no further trouble was experienced. At another time a complaint was received from a consumer stating that it was impossible to use the water due to a very obnoxious taste and odor. This residence was located very near to a standpipe furnishing water to a small area. Investigation revealed that the lock on the hatch cover had been broken and a skunk thrown into the standpipe. Needless to say the tank was immediately emptied, sterilized and refilled, which cured the trouble. The above two examples are cited to impress upon those responsible the necessity of making regular checks of their water storage facilities, including all covered reservoirs.

Consumer complaints due to taste and odor originating at the purification plant are general in scope and many times tax the ingenuity of the operator to find a method of clearing the trouble. As stated in a previous article in this magazine, the operator has at his disposal chlorine, chorine dioxide, ammonia, activated carbon and copper sulfate. Depending on the source and nature of the taste and odor he can use one or all of the above and usually will find one or a combination which will clear up the trouble. It is most important that the operator be on watch for taste and odor and if the particular supply is subject to this condition, regular tests should be made, so that at the first sign of trouble remedial measures may be started immediately.

Some waters are quite highly corrosive. They not only cause trouble in the distribution system but in the small piping and hot water tanks in residences and business establishments. A water of this character should be stabilized. It is not too expensive and relieves the operator of many complaints of red water, particularly on the hot water systems.

Corrosion, Hardness and Iron or Manganese

Waters containing iron or manganese cause a great many complaints. There will not only be a deposition in the mains but this will cause staining of the plumbing fixtures and give trouble in the water meters. The cost of correction depends on the type of iron or manganese removal equipment installed, but regardless some relief should be given the consumers when the iron or manganese content of the water is high enough to stain plumbing fixtures, discolor clothes being laundered, or give trouble in the meters. The meters are the "watchdogs of the treasury" and if there is any property in the water which would slow down or eventually stop the meters an investment to correct this condition will pay off.

Hard waters are another source of consumer complaints. The scale formed on the inside of the piping eventually clogs to such an extent that the customer gets very little water, and then follows considerable expense in replacing his piping. The hard waters consume excessive quantities of soap and scale up cooking utensils. From an economic standpoint a city or private water company can and should provide a water which is reasonably soft. There is no doubt that the consumer would be willing to pay a little higher rate for softened water because the rate increase would not equal the additional expense for soap and hot water heating coils and pipe replacements. Individual household softeners are coming into use on a rental basis, that is, the zeolite filter bed is replaced at regular intervals by a company specializing in this service and the cost per month depends on the size of the installation and frequency of changing.

Due to the large increase in manufacturing facilities during the past 25 years many water supplies using rivers as their source of supply have begun to run into difficulties caused by the wastes from manufacturing processes. Considerable trouble due to taste and odor has been experienced by many plants as well as increased organic loads. Either may pose a most difficult problem for the operator but if a satisfactory water is to be furnished the public some method must be worked out whereby the finished water will not be the cause of complaints.

Rates vs. a Pleased Public

The consumers have been educated and are entitled to a satisfactory water at all times. The rates are established and the average customer pays the charge without complaint. If he is willing to pay the established rate then the agency supplying the water should see that he in turn is furnished with a water that is satisfactory at all times.

The average operator has little cause to complain himself, because in the past the consumer has had to put up with quite a little. Algae tastes and odors occurred in many supplies at some time during every year. The consumer was told that everything was being done to correct it and it was, but until the algae growth had been killed and the resulting taste and odor passed through the system, the consumer had to take it. The results of research and experimental work have placed the operator in a position to cope with nearly any condition which may arise. Sometimes a lack of finances or shortsightedness on the part of the governing body will handicap the operator and keep him from producing a satisfactory water, whereas, if the proper equipment and materials are provided, the number of consumer complaints can be kept at a minimum. The public is less ready to accept excuses for sub-standard water than in years gone by—something which operators must take cognizance of.

A water to be satisfactory from the consumer's standpoint must be 1—clear; 2—colorless; 3—odorless and tasteless; 4—non-staining due to iron or manganese; 5—relatively non-corrosive; 6—relatively soft.

The aim of the operator should be to produce a water with all of these characteristics. If he has not the "know-how" he is destined to be adjudged no more "satisfactory" than the product which he supplies.

PRESIDENT OF AMERICA'S OLDEST WATER WORKS ASSOCIATION ABASHED

Q.—What is America's oldest water works association?

A.—The AMERICAN WATER WORKS ASSOCIATION!

This is the question and answer that "Teacher" Harry E. Jordan, Sec'y of A.W.W.A., should have given a certain president of A.W.W.A. to write 100 times after school. What's more, such punishment of any "Prexy" who doesn't know the true relative age of his Association would appear to be deserved. Therefore, in all humility the following correction and confession is offered "in the Market Place".

In an editorial in the November issue of this magazine the writer, in commenting on "A Revitalized N.E.W.W.A.", referred to the New England Water Works Association as "America's oldest association in the water supply field." When the November number of *Water & Sewage Works* hit the desk of one Harry Jordan, A.W.W.A.'s eagle-eyed secretary, that same "gent" hit the ceiling of 500 Fifth Ave., New York City—and all but went through the roof. When he came down, in no uncertain terms he dictated a letter to the Editor of *Water & Sewage Works* in the inimitable "Jordanian" style from which the following paragraph is taken—

"It is O.K. to dress up the N.E.W.W.A. in any way you like, but please leave the "beard" to the A.W.W.A.—We grew it and intend to keep it."

Following this statement the Secretary of A.W.W.A. gives dates and evidence proving that the A.W.W.A. has just claims to the distinction of being "America's Oldest Water Works Association"—if not in fact the "World's Oldest." We realize that this is to come as a genuine surprise to many—and particularly to a number of New Englanders.

Facts are that A.W.W.A. was organized and held its first annual meeting at Washington University in St. Louis, Mo., March 29, 1881. Records show that the N.E.W.W.A. was organized on June 21, 1882. Therefore, A.W.W.A.'s "beard" is older than N.E.W.W.A.'s by 1 year and 3 months.

The Confession.—If one hears a statement repeated often enough without refutation, it is but human to accept it as fact. In this the writer finds that he was not alone by far in his erroneous belief that N.E.W.W.A.'s "beard" was more hoary than that of A.W.W.A.—in fact, we find that several of N.E.W.W.A.'s official family have until now been under the same impression as that of the writer. It all goes to show what a wonderful thing indoctrination can be.

Ed. Note:—This Confession of an error by the writer in an editorial in this magazine constitutes the first during his seventeen years of editorial writing. The question now uppermost in his mind is—"Is A.W.W.A.'s "beard" large enough to hide the very crimson face of its president?"—*Linn H. Enslow*

YOU CAN'T CUT WITH HALF A SCISSOR

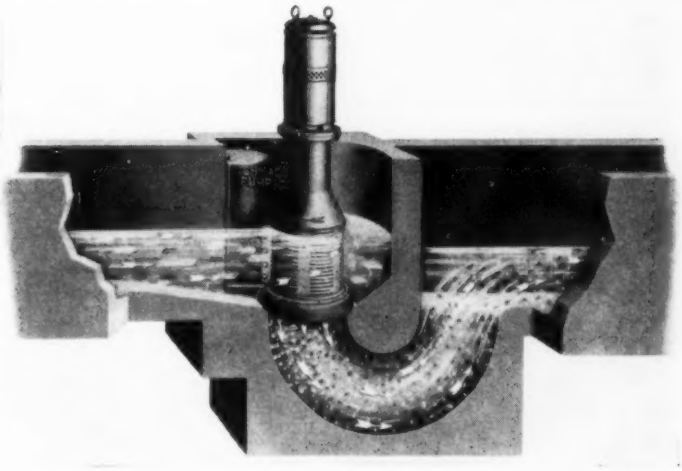
The 25A COMMINUTOR. This machine will handle flows averaging up to 10,000,000 gallons a day when set in a channel of proper design. The scissors point to the shear bars and cutting teeth on the slotted drum.

When you specify the CHICAGO COMMINUTOR you get both halves of the scissors.

The channel acts as the holding and feeding half of the scissors. The cutting teeth and shear bars of the COMMINUTOR drum make up the cutting half of the pair.

Years of research and knowledge gained through more than 2,000 successful installations prove conclusively that the hydraulic characteristics of the channel in which the COMMINUTOR is placed are as important as the cutting mechanism itself.

The form of the channel which makes effective comminution possible is an exclusive feature of the CHICAGO COMMINUTOR. Clogging and binding of coarse solids in CHICAGO COMMINUTORS is positively eliminated.



Cross section view of a typical channel design for the CHICAGO COMMINUTOR. Detailed drawings of acceptable channel forms are available to qualified engineers. For further information on COMMINUTORS, sizes, capacities and channel design write for Bulletin 185.

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SEWAGE EQUIPMENT DIVISION

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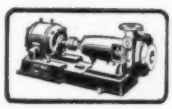
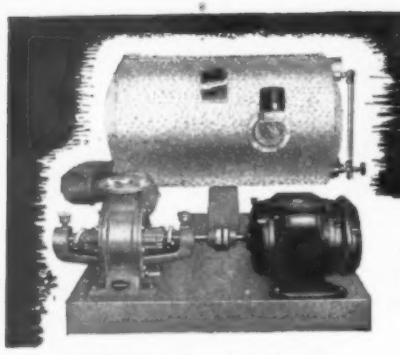


Flush Kleen, Scru-Peller, Plunger. Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers, Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Comminutors.



CONDENSATE RETURN *at its* BEST

Capacities to 150 G.P.M.
(Both Horizontal and Vertical)

APCO Horizontal Simplex Condensation Return Unit

These units are available in simplex and duplex types—designed for the automatic return to high and low pressure boilers of the hot water condensation from radiators, coils, etc. Catalogued in sizes ranging from 2,000 to 100,000 sq. ft. equiv. radiation. Larger sizes available.

APCO TURBINE-TYPE PUMPS

Apcos are ideal for the above service or any small capacity, high head duty. The one moving part, the impeller, is free running, therefore unaffected by heat expansion. Ability to maintain practically constant capacity against drastic pressure conditions is another of many distinctive features.

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HORIZONTAL SPLIT CASE
Single & Two Stage
SIDE SUCTION
VERTICAL
NON CLOG
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SPECIAL DESIGN
Write for CONDENSED CATALOG "M"
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AURORA Always PUMPS

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. . . COUNT 'EM!

1. STRONG electroforged construction for easy erection.
2. MAXIMUM OPEN AREA for light and air.
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BLAW-KNOX ELECTROFORGED STEEL GRATING

MEETINGS SCHEDULED

FEB. 6-10—COLLEGE STATION, TEXAS
Texas Water and Sewage Works Assn. Short School. Sec'y, V. M. Ehlers, 510 E. 5th St., Austin 2, Texas.

FEB. 17—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston 8, Mass.

FEB. 17—NEWARK, N.J. (Essex House)
New Jersey Section A.W.W.A. (Luncheon Meeting) Sec'y, C. B. Tygert, P.O. Box 178, Newark, N.J.

MAR. 15-16—ANN ARBOR, MICH. (School of Public Health)
In-Service Training Course of Michigan Sewage Works Assn. Director, Harry Miller, School of Public Health, University of Michigan, Ann Arbor, Mich.

MAR. 17—BOSTON, MASS. (Statler Hotel)
New England Water Works Association. Sec'y, Jos. C. Knox, 204 Tremont Bldg., Boston 8, Mass.

MAR. 23-25—TRENTON, N.J. (Hotel Stacy-Trent)
New Jersey Sewage Works Association. Sec'y-Treas., M. S. Kachorsky, P. O. Box 283, Manville, N.J.

MAR. 31-APRIL 1—NATURAL BRIDGE, VA. (Natural Bridge Hotel)
Virginia Industrial Wastes & Virginia Sewage Works Association. Sec'y, A. H. Paessler, 815 E. Franklin St., Richmond 19, Va.

APR. 1-3—PRESCOTT, ARIZONA
Arizona Section A.W.W.A. Sec'y, Mrs. Helen Rotthaus, State Department of Health, Phoenix, Ariz.

FEB. 8-9—PORTLAND, MAINE (P.W.D. Service Bldg.)
Maine Water Utilities Association. Sec'y, Earl A. Tarr, Winthrop Water Dist., Winthrop, Me.

APR. 8-9—GREAT FALLS, MONTANA (Johnson Hotel)
Montana Section A.W.W.A. Sec'y-Treas., C. W. Brinck, State Board of Health, Helena, Mont.

APRIL 11-13—LITTLE ROCK, ARKANSAS
Arkansas Water & Sewage Conference. Sec'y, Dr. Harrison Hale, Univ. of Arkansas, Fayetteville, Ark.

APR. 20-22—INDIANAPOLIS, IND. (Lincoln Hotel)
Indiana Section A.W.W.A. Sec'y-Treas., C. H. Bechert, Indiana Dept. of Conservation, State Library Bldg., Indianapolis, Ind.

APR. 21-22—HUTCHINSON, KANSAS (Bisonti Hotel)
Kansas Section A.W.W.A. Sec'y-Treas., M. C. Hagar, Supt. Water Department, City Hall, Lawrence, Kansas.

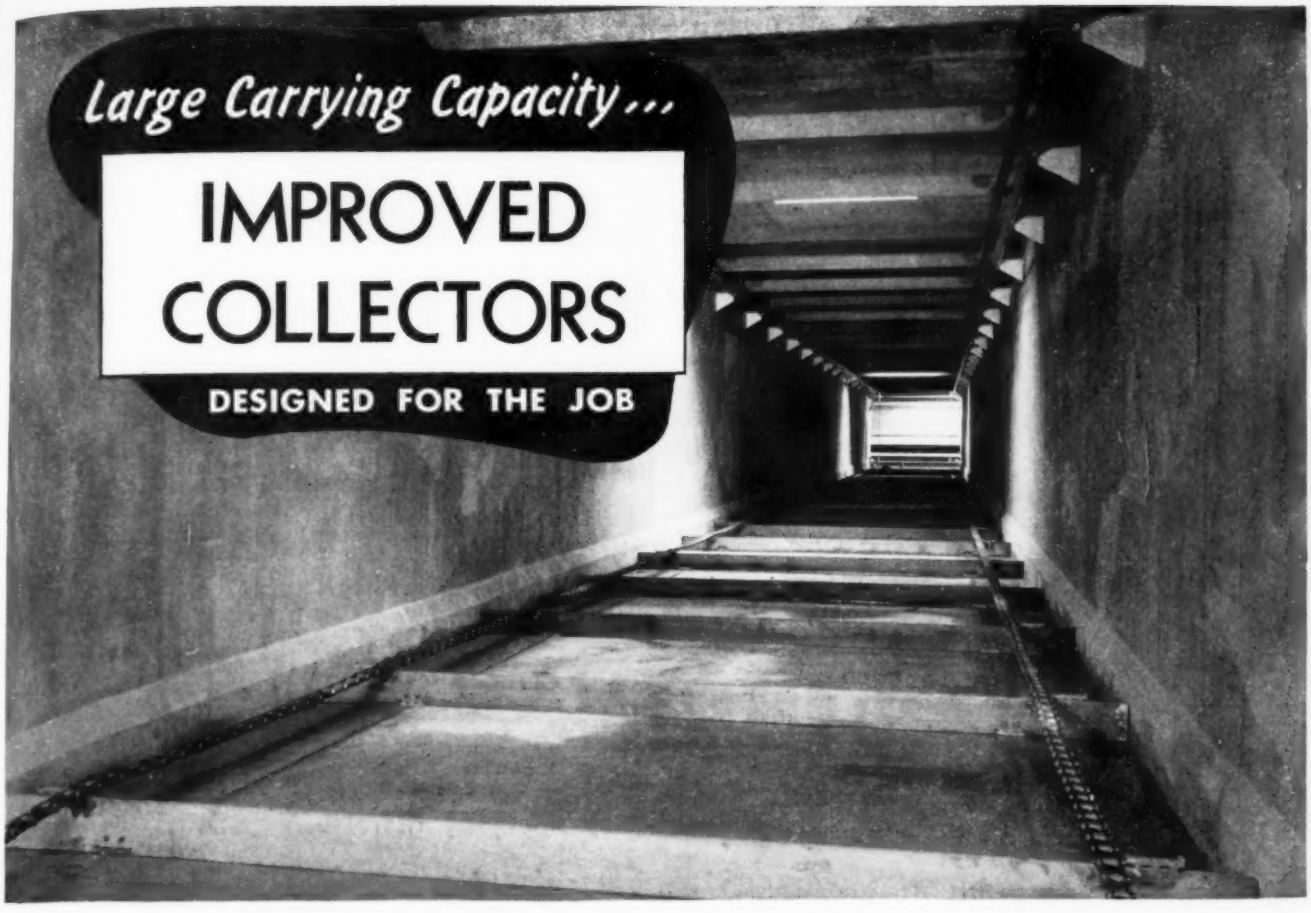
APRIL 24-27—QUEBEC CITY, QUEBEC, CANADA (Chateau Frontenac)
Canadian Section A.W.W.A. Sec'y, Dr. A. E. Berry, Ontario Department of Health, Parliament Bldgs., Toronto, Ontario, Can.

APRIL 28-29—ELMIRA, N.Y. (Mark Twain Hotel)
New York Section A.W.W.A. Sec'y-Treas., R. K. Blanchard, 50 West 50th St., New York, N. Y.

MAY 12-14—BELLINGHAM, WASH. (Bellingham Hotel)
Pacific-Northwest Section A.W.W.A. Sec'y-Treas., Prof. Fred Merryfield, Oregon State College, Corvallis, Ore.

MAY 25—BRISTOL, CONN.
New England Sewage Works Association. Sec'y, Walter E. Merrill, State Dept. of Health, State House, Boston, Mass.

MAY 30-JUNE 3, 1949—CHICAGO, ILL. (Stevens Hotel)
American Water Works Association Annual Conference. Exec.-Sec'y, Harry E. Jordan, 500 Fifth Avenue, New York 18, N.Y. (All reservations will be cleared through the A.W.W.A. office. Reservation forms will be mailed to members after November 1.)



for primary and secondary settling tanks

Jeffrey Collectors—designed for rectangular shaped settling tanks — simplest and most efficient type of sedimentation device.

Large Carrying Capacity — permits intermittent operation.

Stable Conditions of Flow—resulting from proper baffling of influent and correct location of effluent troughs.

Considerable Power Saving—one-half revolution of conveyor once or twice daily sufficient to remove all settled sludge — thicker sludge and clearer effluent.

Positive Movement of Scum — to effluent end of tank for removal by Scum Removers.

These Collectors — for small, medium or large tanks—have been installed in many plants—all same general, well-proved design. Besides we make Bar Screens, Grit Washers and Collectors, Scum Removers, Chemical Feeders, Grinders, Sludge Elevators, Flocculation Equipment, etc.

A competent Sanitary Engineer, well versed in the treatment of water and sewage by mechanical means, will be glad to make recommendations.

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Alhydro FLOC PRODUCER

FOR INDUSTRIAL OR MUNICIPAL WATER TREATMENT PLANTS

"Sure ends cold water floc troubles."

"RIGHT! Warm or cold, ALHYDRO always works."

Regardless of water temperature, clarity or pH through a wide range, the ALHYDRO unit produces a readily controllable concentration of aluminum hydroxide floc. Moreover, ALHYDRO floc is completely stable . . . if broken up will re-form immediately.

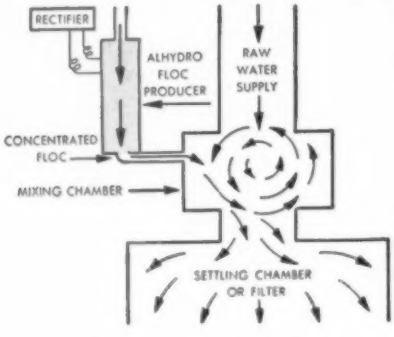
SOLVES CHEMICAL STORAGE PROBLEM

Since the ALHYDRO unit produces floc by low voltage, d.c. electrolytic decomposition of aluminum plates, it makes 69 lbs. of aluminum treat as much water as nearly ¾ of a ton of ordinary coagulants...greatly minimizes storage problems.

SIMPLE AND TROUBLE-FREE OPERATION

The ALHYDRO FLOC PRODUCER requires a minimum of attention and maintenance. One unit measures only 45″ x 13″ x 34″, and will treat an average of 300,000 gallons of water a day. The ALHYDRO unit may be installed singly or in multiples, in existing or proposed water treatment plants.

This installation of ALHYDRO FLOC PRODUCER in your water treatment plant will provide you with these advantages—



- **Better water at competitive costs**
- **Usually eliminates the need for conditioning or correcting water before or after treatment**
- **Simplicity of operation**
- **Minimized storage problems**
- **Easily controlled floc concentration**

DESCRIPTIVE FOLDER—FREE!

This folder describes and illustrates the operational advantages of the Alhydro Floc Producer. See how you can simplify the treatment of drinking water or water for industrial use. Write for free copy today.

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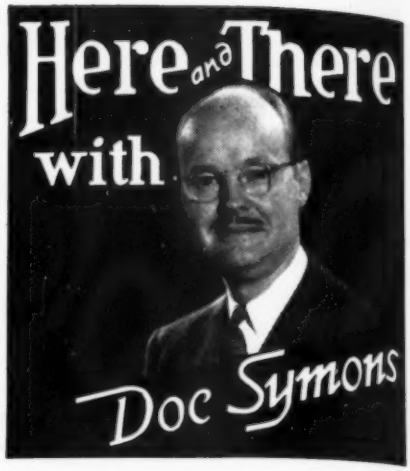

H.T.M.A.—And with the New Year just four days away, I suppose you think I should be taking stock and making either my New Year Resolutions or my annual predictions. There won't be either this year. Instead, I'd like to catch up on a few stories of the past convention season. Before I do, however, here's a quickie about my Christmas Day.

* * *

Small World No. 6.—It was mid-afternoon on that day of delights, the tree was denuded of its burden of gaily wrapped boxes, the gifts had been opened, the inevitable mess of papers picked up, and I had just carved the traditional bird and—the phone rang.

It was a long distance call—all of the way across Westchester County—and the well-wisher on the paying end of the wire was none other than that handsome member of the Society of Council Bluffers, Jake (R. B. Carter Co.) Van Atta. After an exchange of greetings with Mary and Jake, they introduced me, via the phone, to their host, Jimmy Powers, author of the sports column, "The Powerhouse" in the *N.Y. Daily News*. Powers, whose column is a must at our house, as well as some three million others, has often mentioned Jake and also Fred Stuart, a fact which has been duly noted in "Here & There."

When I returned to our groaning festive board, after best wishes from one columnist to another, I told our boy, Jimmy Symons, that I had just met Jimmy Powers. Whereupon, my sister-in-law, Pat Urban said, "Why I knew him when Frank and I were at the Academy at King's Point." Seems Powers was Director of Publicity at the Academy, during the war, when my brother-in-law, the late Capt. F. R. Urban, USN, was Senior Medical Officer at the United States Merchant Marine Academy. — Small World!

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Gate Valve

MANUAL,

ELECTRIC OR

CYLINDER OPERATED

The unique side wedging action employed in the Smith Gate Valve positively prevents premature lateral expansion of the discs and consequent binding and scoring of the seats while the valve is being operated.

28

GATE VALVES
CHECK VALVES
FIRE HYDRANTS
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TAPPING SLEEVES AND VALVES
WATER SERVICE BRASS GOODS

THE A. P. SMITH MFG. CO.

ESTABLISHED 1896

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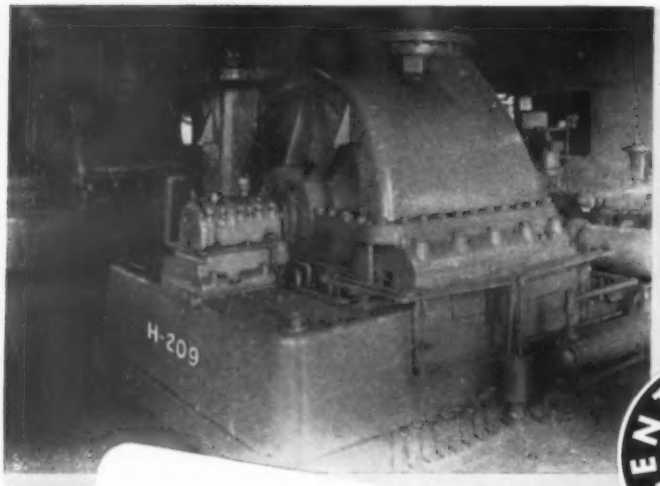
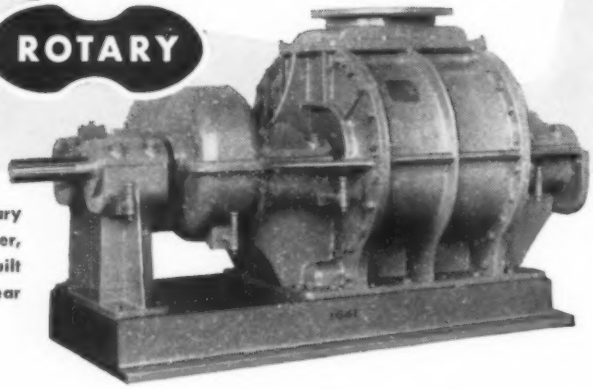


Battery of five R-C multi-stage, Centrifugal Gas Exhausters driven by steam turbines.

CENTRIFUGAL

R-C dual-ability plays no favorites!

ROTARY



Standard Rotary Positive Blower, Type RCD, built in 8" to 22" gear diameters.

With a wide choice of Centrifugal and Rotary Positive Blowers available, you can usually select standard R-C units to meet your specific applications. Capacities range from 10 CFM to 50,000 CFM or higher for special requirements. Roots-Connersville is the only blower manufacturer offering you this *dual choice*.

We're impartial as to drives, too. We supply them or you can utilize drives already available. Direct motor, speed changer or V-belt, steam turbine, gas engine or other modern types provide high-efficiency operation for R-C units. That's another phase of R-C *dual-ability*.

With R-C equipment on the job, you'll enjoy long-time, trouble-free performance. That's because of sound design and sturdy construction, based on 95 years of building gas and air handling equipment, *exclusively*. For any such problem, consult R-C *dual-ability*.

ROOTS-CONNERSVILLE BLOWER CORPORATION
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BLOWER BUILDERS R-C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★

I see by the *Pipe Line Post* of the Public Service Commission of Halifax, that John E. Kleinhenz, Publicity Director, Indianapolis Water Co., is a handy man with the words as evidenced by his Christmas letter (to Halifax) which that pretty Norma Nelson, Editor of the *P.L. Post*, published in the Christmas issue of that house organ.

* * *

And now to some memories of the Convention Circuit of last year. Here, for example, is a memorable shot of two demon pianists performing at the open house session of the Penna. Water Works Operators Assn. Time—About 11 p.m. Place—University Club, Penn State College. Performers—From left to right: That Philosopher of the Omega Machine Co., R. J. (Rollie) Leveque, and the one, the only, the incomparable, the lovely, the—(words fail me), Grace (Mrs. Fred) Stuart of Baltimore.

* * *

A Gal I Know Likes Conventions, Too!—It was at the Detroit Federation Meeting; I had my girl, Gin, with me and outside the door of the meeting hall, we ran into Jack and Isabel (Norski) Wirts of Cleveland. By way of introduction, I said, "Isabel, this is Virginia."—To which Isabel replied, "Virginia who?"—Ouch!!!

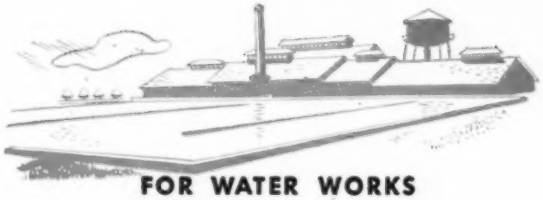
To make up for that slightly insinuating crack, Isabel sent me the following *"Female Convention Goer's Point of View,"* it being her reaction to that meeting. Here 'tis, just to show you that the girls like conventions too.—

"As a member of the female contingent at the Detroit Federation Meeting, I'm fully convinced that every man in the sewage field should take his wife to the F.S.W.A. conventions. Herewith, a few of my memories of Detroit—

"—Orchids to the Chairman of the Ladies Arrangement Committee, Mrs. Virgil Anderson of Detroit and her assistants for their successful efforts.

GENERAL CHEMICAL "ALUM"

...Equally Efficient for Coagulation of WATER and SEWAGE!



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1. Produces crystal clear water.
2. Gives better floc formation.
3. Promotes better settling and longer filter runs.
4. Aids in reduction of tastes and odors.
5. Has no chlorine demand.
6. Is a *low cost* coagulant.
7. Superior in tests against other coagulants.
8. High in quality. Its constant uniformity can be depended upon.

FOR SEWAGE PLANTS

1. Clean, easy to handle.
2. Dry feeds well or dissolves readily for solution feeding.
3. Simple application. Requires only low cost feeding apparatus and minimum attention.
4. Clear, colorless effluents are possible.
5. Sludge digests readily.
6. Treated digested sludge dries quickly with minimum of odor.
7. Chlorine consumption is cut due to lower demand of clarified sewage.
8. Economical to use.

Aluminum Sulfate is almost universally accepted by water experts as the best coagulant for removal of turbidity, color and bacteria from water . . . and General Chemical Aluminum Sulfate is the outstanding choice the nation over. That's because its high quality and constant uniformity have given it a time-tested reputation for reliability among operating men in towns and cities all over America.

Municipal officials in charge of sewage treatment also find that clarity of sewage effluent is easily obtainable with General Chemical Aluminum Sulfate for the many reasons outlined above. For your water and sewage disposal systems, specify General Chemical "Alum"—*preferred by most American cities.*

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BASIC CHEMICALS

FOR AMERICAN INDUSTRY

Guaranteed

PIPE WRENCH ECONOMY

No pipe wrench housing repair or expense with

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Attractive new RED Finish!

● The famous RIDGID guarantee is just one of the features that make RIDGID the outstanding favorite of millions. You also like the free-spinning adjusting nut, handy pipe scale on the hookjaw, the comfort-grip I-beam handle with flared end that keeps your hand from slipping off. For real efficiency and guaranteed economy, buy RIDGID wrenches, 6" to 60," at your Supply House.

RIDGID

WORK-SAVER PIPE TOOLS

THE RIDGE TOOL CO. • ELYRIA, OHIO

"—The quiet beauty of Mrs. F. W. Mohlman of Chicago—just couldn't keep my eyes off of her.

"—That glamour gal, Mrs. Harry E. Schlenz, who adds quite a fillip to any meeting.

"—Hal Hutton of W & T who gets my vote for the 'Man of Distinction'—if he cares.

"—Col. Hardenbergh and that burning cigarette in his mouth all of the time he's talking.—How *does* he do it?

"—George Russell's daughter-in-law, a beautiful voice in a mighty pretty little package.

"—Where was that Sheboygan cheese Jake Klein always used to bring? Did the boys from the Dorr Co. hide it in a closet for the paid up customers?

"—Biggest center of attraction for the elbow benders; the wonderful singing led by Johns-Manville's Paul Harlemert. Trouble was, he recorded it all and the play back was terrific. Won't I ever learn to keep my big mouth shut?

"—*The You-Can't-Miss-It-Department.*—Ralph (Washington, D.C.) Fuhrman's laugh—The Swede (Springfield, Ill.) Larsons' Friendliness—Morris (Schenectady, N. Y.) Cohn's beautiful diction — Wisely, period—Rolf (N. Y. University) Eliassen's constant youth — Frank Woodbury (Cleveland) Jones' haircut—the Van Porter (Atlanta, Ga.) Enloes' southern accent—Art (W.S.W.M.A.) Clark's fishing hat—and—they say women talk too much. Hah! You boys don't do so bad!—

"Conventions are Wonderful!!!—Isabel W."

* * *

Yep, there's one gal I know, who also loves conventions.—But when Isabel didn't mention Doc Symons' Mustache in her "You Can't Miss It Dept.." I grabbed my razor and shaved it off.

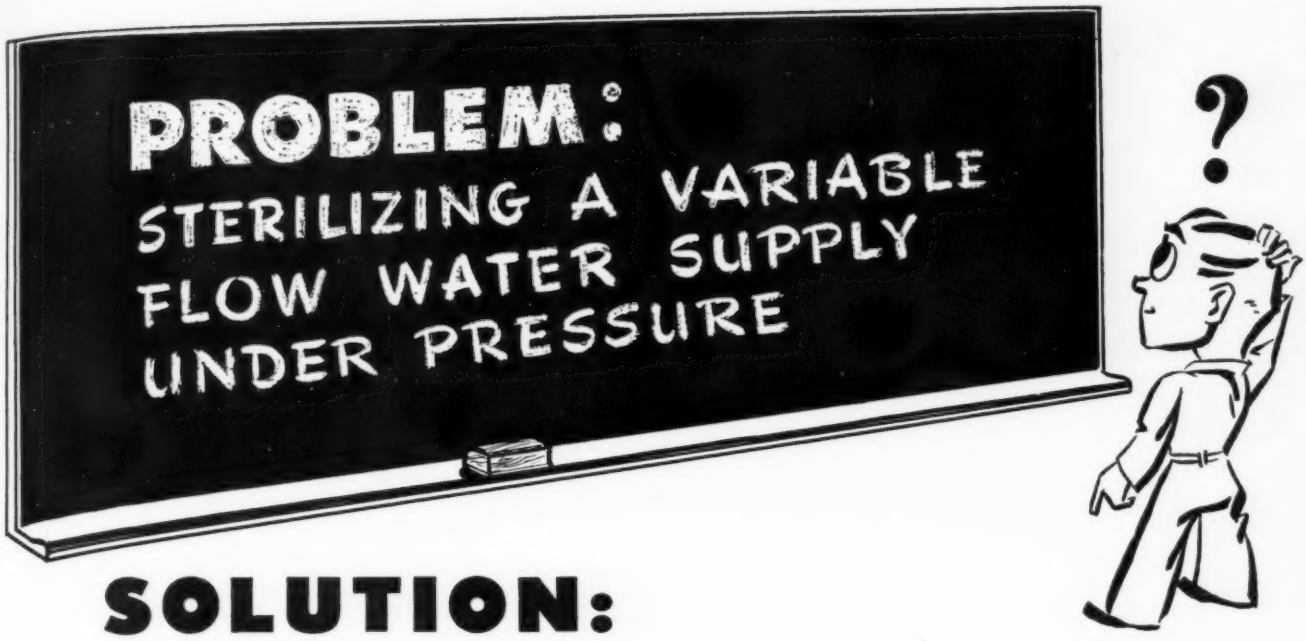
* * *

As a result of that wilful act on my part, I found the following verse in my mail one day. It was written, of course, by my favorite poetess, Helen (Mrs. Ollie) Ball of Toronto.

Sur-prize!

He has skin like a baby's
and the widest blue eyes.
Who is this young, debonair,
MASCULINE prize?

Constrain yourselves, girls!
Don't do anything rash!
It's only OUR DOC . . .
without his moustache.



SOLUTION:

%PROPORTIONEERS% AUTOMATIC AND PROPORTIONAL CHEM-O-FEEDER!

Just install %Proportioneers% Automatic and Proportional Hydraulically operated Chem-O-Feeder and a standard water meter. It is only necessary to know the minimum, average, and maximum flow to be sterilized and the pressures against which the chemical will be injected. All flow is measured by the mechanical water meter and %Proportioneers% equipment starts, varies and stops dosage of chemical in step as the water comes on, fluctuates and tapers off. The %Proportioneers% Low Pressure Chem-O-Feeder shown is treating gravity water supplies against pressures up to 100 p.s.i. Installation is simple and our nearest sales and service representative will assist you in the selection of proper meter and equipment.

RESULT: Fully automatic sterilization of water supply, with chemical fed in strict proportion to flow, without dependence on electricity or other source of power. The only attention required is the occasional refilling of solution tank and checking the chlorine residual to adjust dosage for any variation in the chlorine demand of raw water.

CONCLUSION: Whatever your water treating problem, %Proportioneers% can help you; ask us for recommendations and quotations. Our experience from over 23,000 installations is at your service.

Write for Bulletin SAN-1.

% PROPORTIONEERS, INC. %

9 N. CODDING ST., PROVIDENCE 1, R. I.

WATER WORKS GADGET OF THE YEAR.—I show you here a picture of the Water Works Gadget of the Year 1948. (That's it on the left—the one on the right is the gadget of any year).

Yes, gaze upon the automatic golf caddy, constructed by one Harry Krum, the Water Fixer of Allentown, Penna., while I tell you a story about the boy himself.

It was at State College (of course) last August, and Harry had just done a discussion of a paper by Stuart Coburn, of Metcalf and Eddy, whereupon "Stu" arose and said he was very happy "to get such criticism from the best sewage plant operator, golf player, bridge player, and city chemist in Pennsylvania."

To which Harry responded, "Why limit it to Pennsylvania?"

"Besides," said Harry, recalling when "Stu" visited Harry in Allentown, some 20 years ago, "Coburn didn't know English. He didn't know what it meant when he broke a pipette and some one else said, 'It's All.'"

And say Harry—Is that enough space to repay you for the golf prize you awarded me at the dinner that night in the Nittany Lion Inn?

* * *

It was also at the State College Meeting. When Dean Hammond welcomed the group and said the University was glad to do anything it could for registrants, up popped the irrepressible R. C. (Dick) Beckett, State Sanitary Engineer of Delaware, and asked if it would be possible to have a little more space between the lines on the golf score card.

By now, I presume you know that the wit and wisdom of "Dick" Beckett won't be at State College again, for "Dick" died after an auto accident in mid-December.—We shall all miss him, Sarah.

* * *

Incidentally, Johnny Kleinhenz was the only person who recognized the hands of Harry E. Jordan which I ran in the November issue under the caption, "Guess Whose". Now I wonder if Harry Jordan can remember where that picture was taken.

* * *

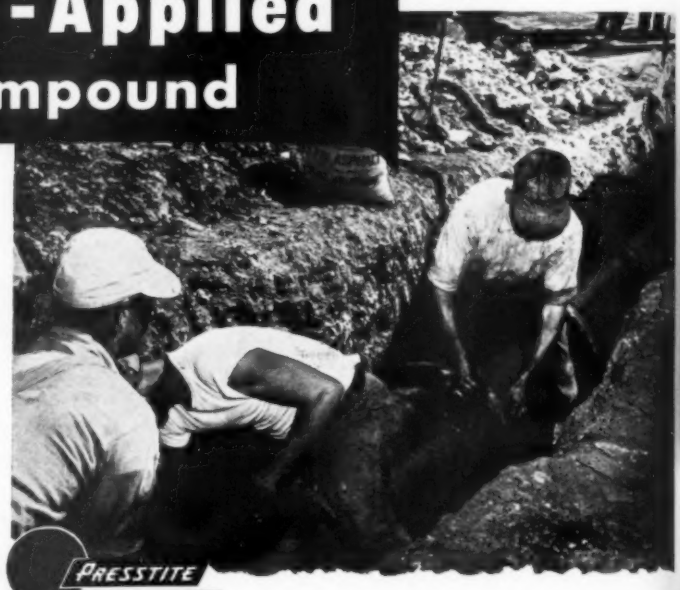
Well, time's up, Kiddies—for this month. The rest of the tales of this peripatetic perigrinator will have to await another issue. But before I go, I want to say that if you'd like to contribute to CARE and at the same time obtain a beautiful handpainted tie, write to me and I'll see that the word gets to Mr. S. A. Greeley, Cons. Engr. of Chicago, whose daughter-in-law makes the ties, and contributes the proceeds to Belgian CARE.

V.T.Y.—Doc.

You'll Get Better Sewer Pipe Joints
...and More in a Day with

KALKTITE Cold-Applied Sewer Joint Compound

Kalktite being used on new sewer construction job at Kirksville, Mo. J. W. Shikles, Kansas City, Consulting Engineers.



Leading contractors report that they get better asphalt joints and more of them in a day with Kalktite than with any other type of asphalt joint. Wet trenches do not delay the job when you use Kalktite.

The use of Kalktite eliminates heating kettles, and the handling of hot dangerous material likely to cause burns to workmen; sticky asphalt on shovels and other tools; and joint runners. Mixed right on the job, Kalktite is easy to use and handle and sets up under water.

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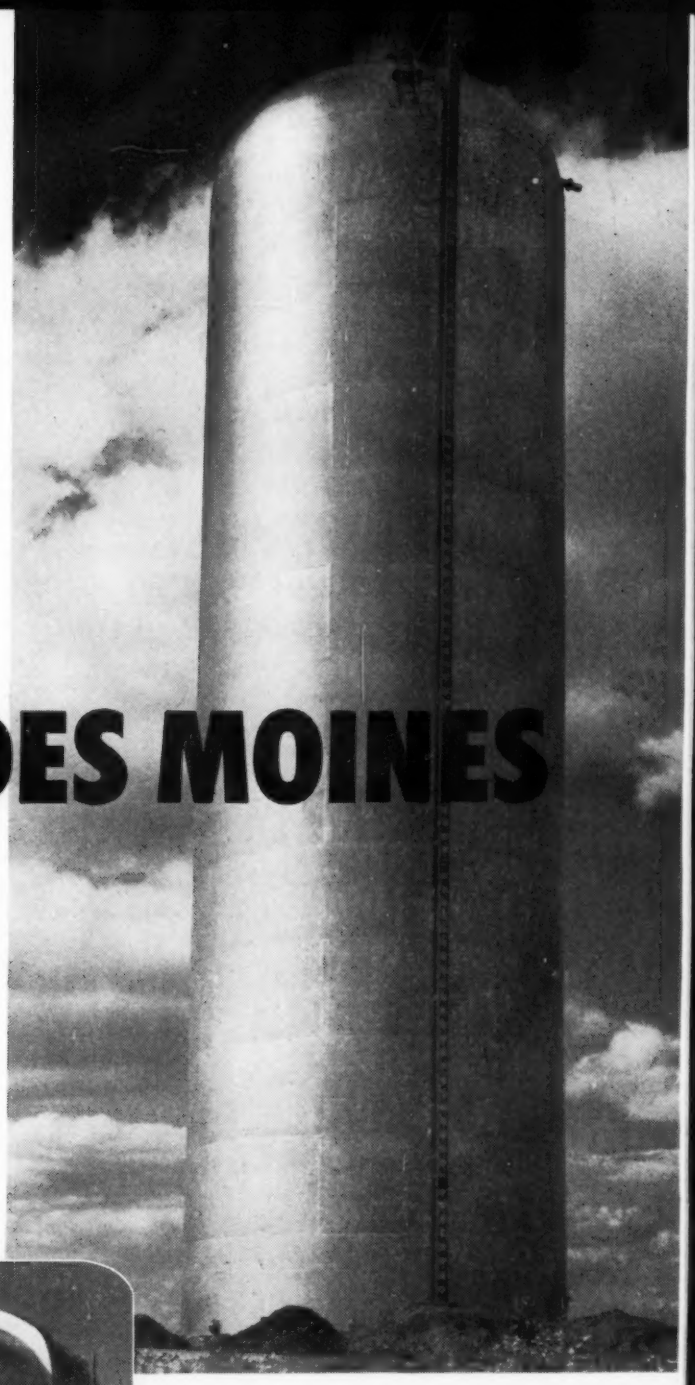

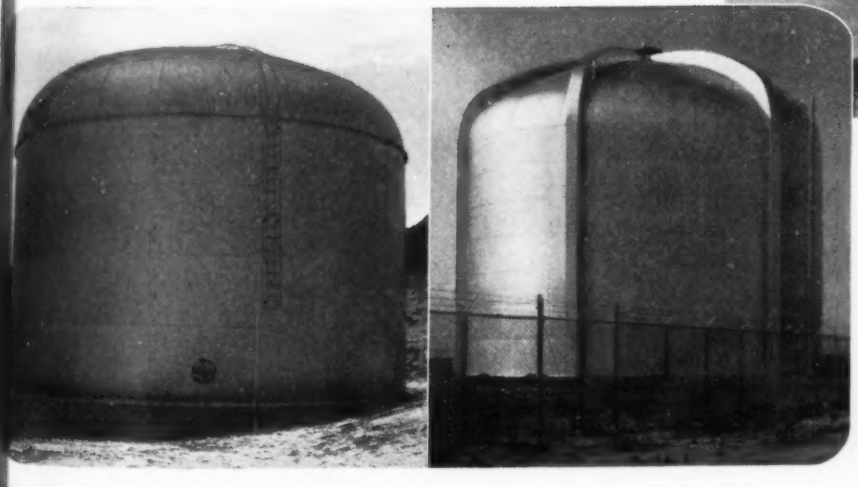

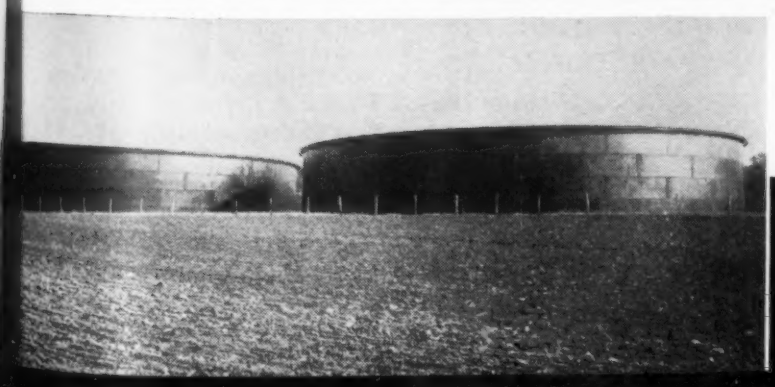

Sound, enduring performance, based on correct engineering, dependable fabrication and careful erection, assures complete satisfaction with Pittsburgh-Des Moines Steel Standpipes and Reservoirs.

Over the years, their first-cost economy, low maintenance, and continued freedom from deterioration make these units an ideal water storage investment. *Write!*

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THE SPILLWAY

[Overflow from the main section]

Positions Open in U.S.P.H.S. for Water Pollution Control

Carl E. Schwob, Chief, Division of Water Pollution Control of the U.S. P.H.S., has announced several vacancies in the organization to carry out the provisions of Pub. Law 845. Appointments may be applied for by qualified sanitary engineers, biologists, bacteriologists, and chemists. Those accepted for the Reserve Corps will have opportunity to make application for appointment into the Regular Corps of the Public Health Service. Salaries range from $3,391 to $8,509.50 per annum, depending on the grade and the type of work.

For further information write to Carl E. Schwob, Chief, Div. of Water Pollution Control, Public Health Service, Washington 25, D.C.

Public Health Service Organizes to Administer Pub. Law 845

The engineering activities of the U. S. Pub. Health Service have been reorganized to make possible the effective administration of the Stream Pollution Act, Public Law 845, which was signed into law last June 30.

The former Sanitary Engineering Division has been replaced by a Division of Sanitation and a Division of Water Pollution Control. Both of these divisions are under the supervision of Mark D. Hollis, Asst. Surg. General and Chief Sanitary Engineering Officer of the U.S. P.H.S. To head the Division of Sanitation, Sanitary Engineer Director Callis H. Atkins will act as Chief, and Sanitary Engineer Director Carl E. Schwob has been named Chief of the Division of Water Pollution Control. Sr. San. Engr. M. Allen Pond has become Asst. Chief of Engineering Activities under Mr. Hollis.

The Div. of Sanitation will assume all responsibilities of the former Sanitary Engineering Division except water pollution control and research in environmental sanitation.

Already the organization of the Water Pollution Control Division has been set in motion. Mr. Schwob, who was with the Illinois State Dept. of Health from 1926 to 1941, and who worked for an equipment firm thereafter until he joined the Pub. Health Service in 1942, has been working on the development of water pollution control since 1945. Under his immediate direction the water pollution control organization and activities are going forward. Offices in each of 14 major river basins will be staffed to implement the program in the field. Headquarters will be in Washington.

The basin offices will be the operating centers and will cooperate with State and interstate agencies, the municipalities, and industry. Technical personnel at these offices will have the support of the research and technical service facilities of the U.S. P.H.S. Environmental Health Center in Cincinnati.

Coordinating these river basin field offices will be Alfred H. Wieters, for many years Director of the Div. of Public Health Engr. and Indus. Hygiene of the Iowa Department of Health. He was recently commissioned Senior Sanitary Engineer in the U.S.P.H.S. and appointed chief

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TO CONDITION NEW MAINS

Before placing new mains in service, or following repairs to old mains, Pittchlor makes it easy to disinfect against contamination. Do it in either of two ways, after pipes and fitting have been cleaned:

1. Place dry Pittchlor in mains before admitting water.
2. Inject a 1% available chlorine Pittchlor solution near the beginning of the new section.

Pittchlor is widely used for on-the-spot uses, such as this. See your jobber or write Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth and Bellefield, Pittsburgh 13, Pa.

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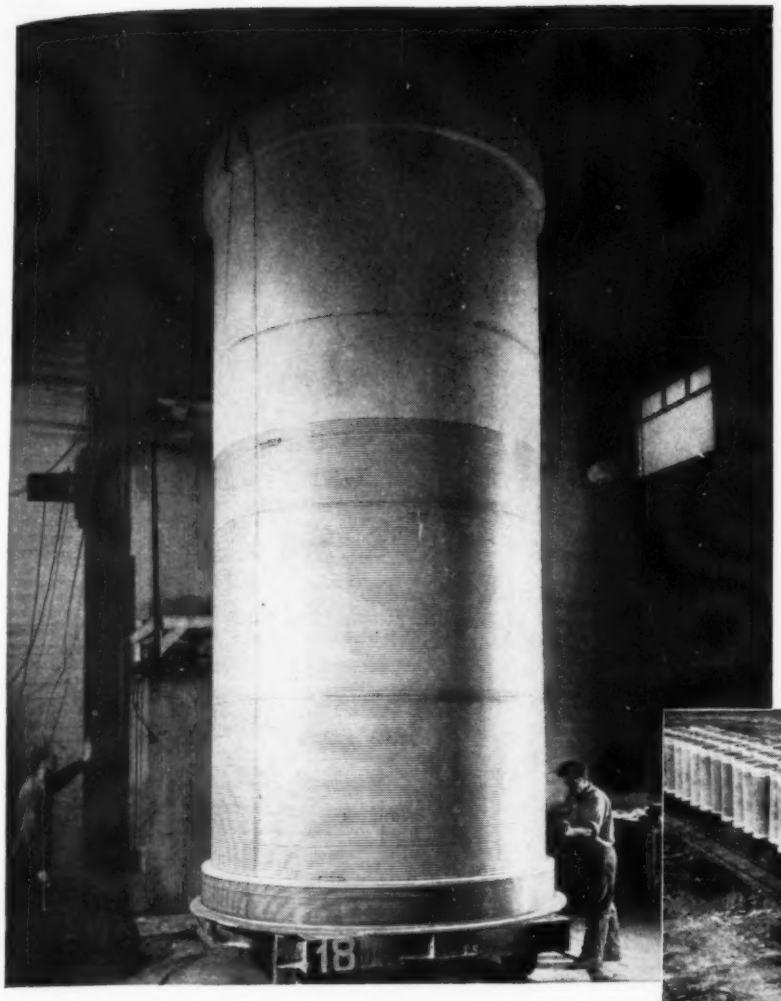

Winding high tensile strength wire on an 18 ft. length of 84 inch diameter Preload Prestressed Concrete Pressure Pipe at Montreal, Canada.

PRESTRESSED CONCRETE PRESSURE PIPE *by* PRELOAD

....Pioneers in Prestressed Concrete Design and Construction

Finished lengths of pipe stored ready for installation in the new Montreal-St. Lawrence water supply intake.

Specify Preload Prestressed Pressure Pipe to attain the following advantages in economy, performance and capital investment value:—

1. **Thinner wall and corresponding lighter weight.**
2. **High internal bursting strength.**
3. **Great external loading strength.**
4. **Substantial economies due to lower first cost; long-term freedom from corrosion and corresponding sustained flow capacity; low maintenance cost; immediate availability of materials.**

Preload is now applying the well known advantages of prestressed concrete construction to pressure pipe of 20 inch diameter and larger, and also is using the Preload-Rocla Internal Expansion Method to make pressurized, prestressed concrete pipe in diameters of 6 inches and larger.

The illustrations show Preload Prestressed Pressure Pipe for the Montreal Municipal Water Supply System's new intake from the St. Lawrence River—a pipeline approximately 10,000 feet in length designed to eliminate the less desirable Ottawa River water.

Each pipe section of 84 inch diameter is 18 feet long and weighs 18 tons. Utilizing the well known Preload Wire Prestressing System the units are built on the site, a procedure which insures no delays, no transportation problems.

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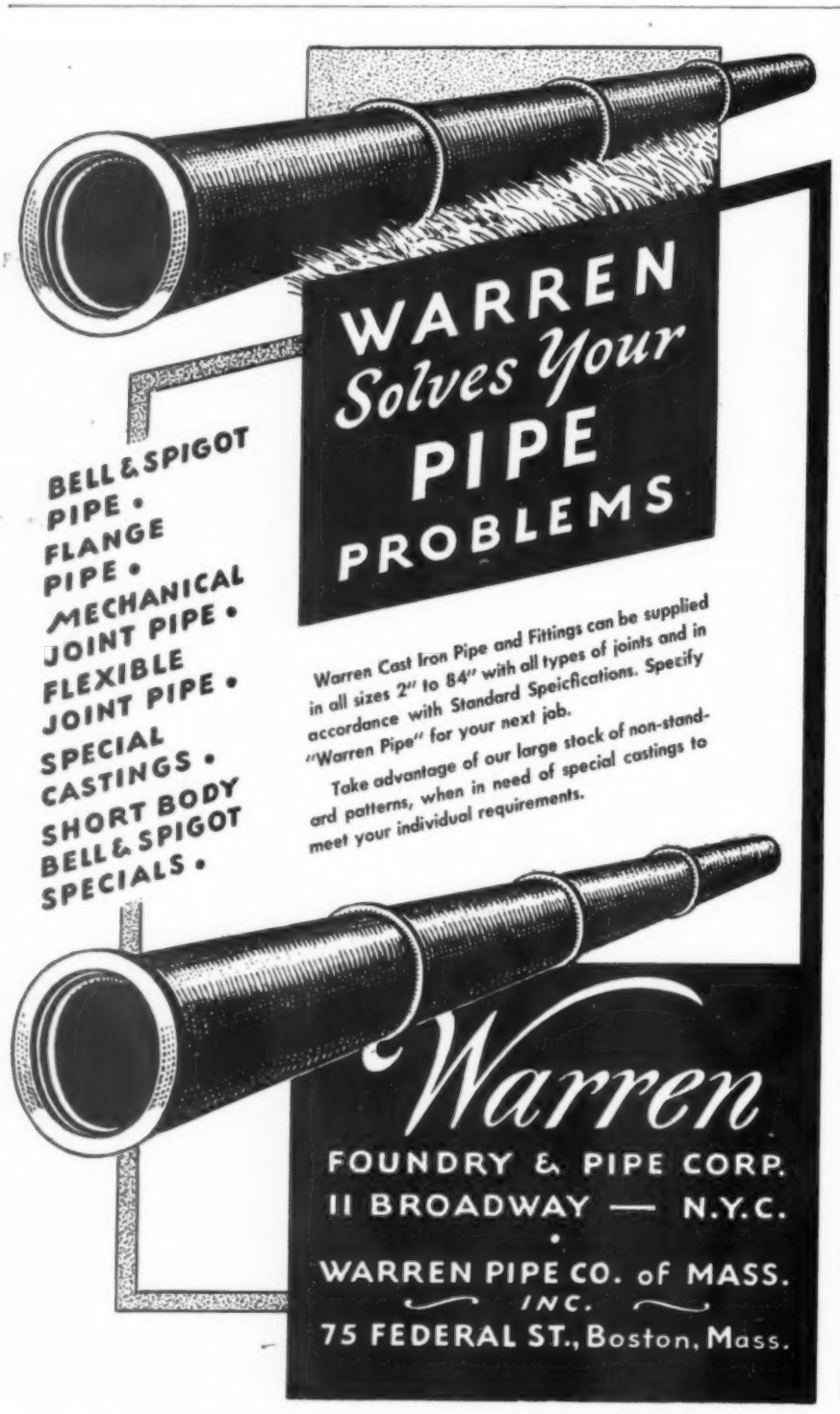
of the Field Operations Branch of the new Division.

Senior Sanitary Engineer Frank E.DeMartini, who has been with the U.S.P.H.S. since 1939 (and with the Calif. State Health Department and San Francisco Water Department between 1927 and 1939) has been appointed Chief of the Technical Services Branch.

A number of assistant engineers have been assigned to the Washington headquarters for a short temporary duty to familiarize them with procedures, before being sent to the river basin field offices. Mr. Schwob recently announced that there is a shortage of technically trained personnel to staff these new offices.

Tentative procedures for obtaining financial assistance for planning and constructing treatment works have been drafted by the Public Health Service and the Bureau of Community Facilities of the Federal Works Agency. According to the law, states, municipalities, or interstate agencies must obtain approval of proposed projects from the appropriate state water pollution agency or agencies, and from the Public Health Service.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Annual Reports of Interest

The following brief abstracts have been made of annual reports received within recent months. Copies of the reports may be obtained by writing to the superintendent of the department or plant in question.

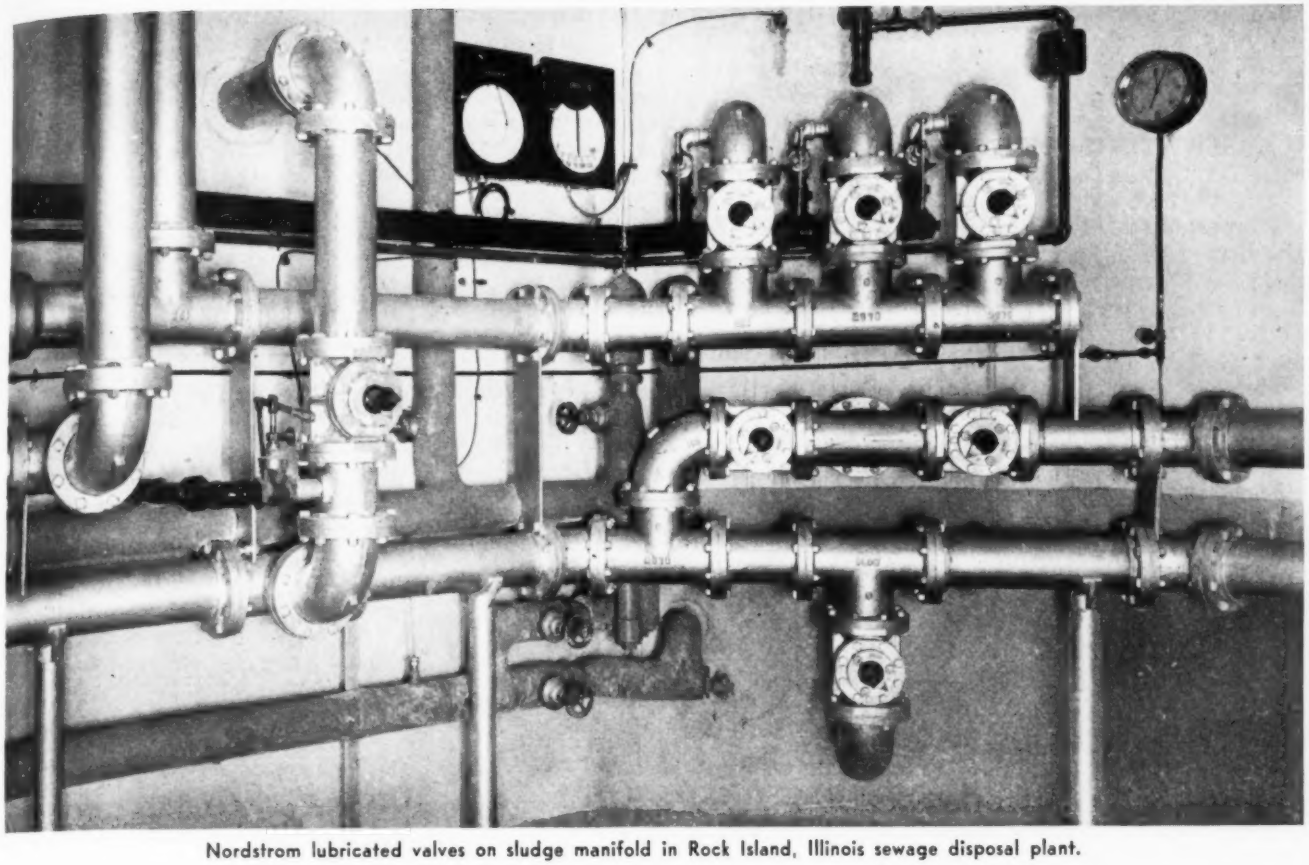
WATER SUPPLY

Lewiston, Idaho. 1947-48 (42 pages) W. P. Hughes, City Engineer. Report covers engineering, airport, water and street departments. Daily average pumpage 147 gpcd. Number of meters in service, 4,445. Income of Water Department, $117,-162. Expenses Water Department, $132,495.00. 10 year average cu. ft. per service, 30,495. 10 year average revenue per service $31.13. 10 year revenue per 1000 cu. ft. $1.02. 89 percent of water sold through meters. Unaccounted for water amounts to 6 percent.

Portland, Me., Water District; 1947. (99 pages). General Mgr., F. J. Reny. Auditors' report occupies 34 per cent of total. Water is very soft (only 22 ppm. of total solids). 516 new services totaling 12,772 ft. were installed during the year; 314 services were renewed; 62 services discontinued and 13 cleaned. Service leaks repaired, 121. Seven new hydrants and 52 new gate valves installed. Seven main breaks repaired, of which six were cement, one cast iron. Cause of leaks, five joints and two breaks, both the latter cement.

Pasadena, Calif., 1947-48. (68 pages.) Morris S. Jones, Chief Engr., and Gen. Mgr. Water production was upped 9.7 per cent from previous year. Number of metered services 33,720, of which 1396 were added during the year. Water sales were $1,396,281.38, a gain of 14.1 per cent over the previous year. Including operating and non-operating revenues, the total gross revenue was $1,601,633.98, a new high. Operating expense was $1,337,555.14, an increase of $101,555.60.

Water rates were increased during the year approximately 20 per cent. Water main construction for the year totaled 64,849 ft., of which 59,040 ft. was cast iron from two to twenty inches. New additions were made to the pumping system at several booster stations, and construction commenced on a new reservoir built entirely of gunite. Complete



Nordstrom lubricated valves on sludge manifold in Rock Island, Illinois sewage disposal plant.

The most efficient valve for *SEWAGE DISPOSAL* has lubricated, tapered plug.

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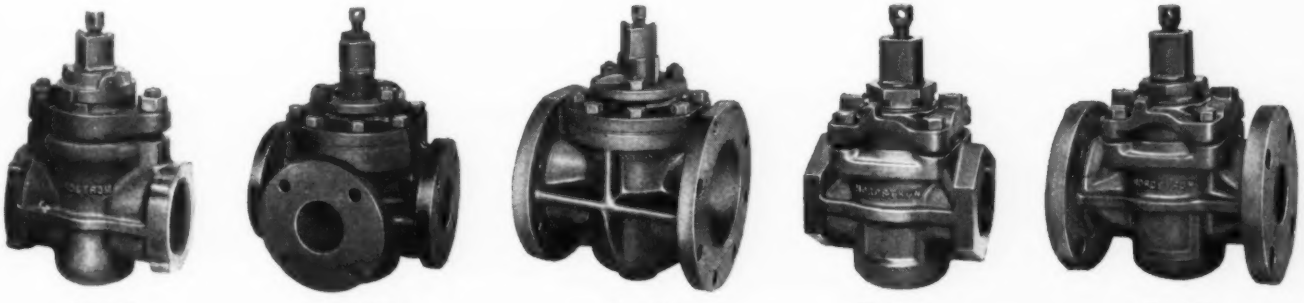

Fig. 142 Fig. 3465 Fig. 143 Fig. 114 Fig. 115

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tables and charts showing the operation of the plant and system are included.

SEWAGE TREATMENT

Minneapolis-St. Paul Sanitary District; 1947. (98 pages). Chief Engr. and Superintendent, Kerwin L. Mick. This is the fifteenth report of the District. 1947 expenditures were $445,850.42. Issuance of fresh sludge cake to farmers for fertilizer was not resumed because economically unfeasible to comply with the State Board of Health requirements regarding the potential health hazard.

The report contains plant descriptive data, operating data, analytical data, cost data, and data on the Mississippi River. Average flow 125.6 mgd., suspended solids 280 ppm., 5-day B.O.D. 200 ppm. Chemicals required for conditioning 1.28 per cent ferric chloride, 3.69 per cent lime. Filtration rates, 3.28 lb. per sq. ft. per hour, or 0.29 lb. per sq. ft. of filter area used. Cost of chemicals per dry ton of sludge solids conditioned was $1.21. Cost of incineration was $1.39 per ton of dry solids incinerated. Total cost of operation and maintenance of sludge disposal system, $4.74 per dry ton. Salaries and wages for maintenance and operation accounted for 65.9 per cent of total cost of operation and maintenance.

Ann Arbor, Michigan. 1947. (14 pages) C. Preston Witcher, Supt. Estimated contributing population 60,000. Average daily flow 6.6 mgd. Gas production per capita 0.9 cu. ft. per day. Cost per mil. gal. for operation $23.73. Total cost per million gallons, including all charges $37.67. Equivalent value of power from gas engine $6,711. Total revenue, $102,666. Plant is overloaded as far as aeration capacity is concerned, but continues to remove B.O.D. effectively. Adjusters are also overloaded. Average volume of loading has been 1 lb. per day for each 17 cu. ft. of capacity, as compared with a desirable loading of 1 lb. per day for 30 cu. ft. capacity. The reduction of solid matter in digesters is 43.5 percent; a 5-acre lagoon constructed the previous summer has been practically half filled during the year. Hydraulic capacity of the interceptor is exceeded frequently and the raw sewage is bypassed directly to the river.

Grand Rapids, Mich. 1947-48 (28 pages). Huntley Delano, Superintendent. Connected population estimated at 180,000 person. 33.6 mgd flow, equivalent to 186.7 gal. per cap. per day. Grit removed totals an average of 1.2 cu. ft. per million gals. treated with approximately 37 percent organic matter. B.O.D. is reduced 14.2 percent; suspended solids reduced 39 percent.

3.81 lbs. dry solids per cu. ft. of digestive capacity per month. Gas production averages 1.12 cu. ft. per capita per day. The net cost of operation amounts to $8.37 per million gallons treated or 53.2 cents per capita per year.

District of Columbia; 1947-48 (19 mimeographed pages). Ralph E. Fuhrman, Supt. Average daily flow reached 160 mgd. for the year ending June 30, 1948. This is an overload of 23 per cent above the design flow of 130 mgd. 420 visitors registered during the year. Grit removed amounted to 7.7 cu. yd. per day, or 1.4 cu. ft. per mil. gal. B.O.D. reduction 36 per cent. Suspended solids reduction 50.3 per cent. Sludge digestion produced 769,000 cu. ft. of

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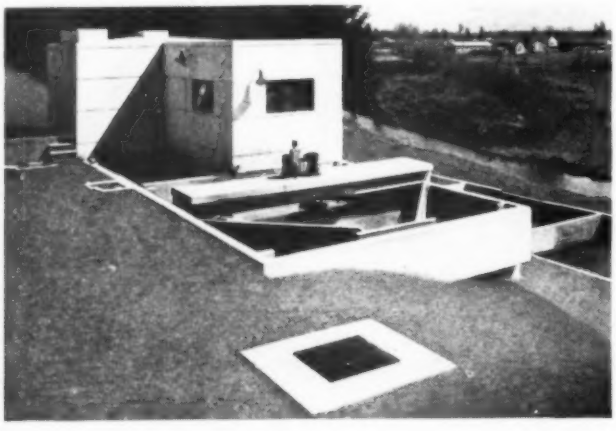

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Many small communities and outlying plants, compelled on the one hand to purify wastes in order to stop pollution, but lacking ample supply of diluting water, have solved their seemingly insoluble difficulty by means of the Yeomans "Package" Aerifier activated sludge plant.

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Here indeed is a highly efficient means of purification designed to fit the modest budget. In a single compact concrete unit of minimum dimensions you get aeration and final sedimentation; producing crystal-clear effluent at remarkably low over-all plant cost. Because there are no odors or flies, the plant can be located near habitation. Operation is simple, with supervision limited to routine check-up. All units are open for visual inspection. With its permanent concrete construction it is a plant that will perform efficiently for many years.

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- WORKABILITY
- WELDABILITY
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for

- COARSE AND FINE SCREENS
- SCREEN FRAMES
- FLOAT CHAMBERS
- SWING GATES
- BUILT-UP SLUICE GATES
- COARSE BAR RACK APRONS
- EFFLUENT WEIRS AND SCUM WEIRS
- STRUCTURAL SCUM BAFFLE BRACKETS
- TROUGHS
- SCREEN HOPPERS
- ORIFICES
- BASKETS
- BOLTS
- ANCHORS
- LADDERS
- FLOAT GAGE CHAINS
- VALVE SPRINGS
- MANHOLE STEPS
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For detailed facts on Everdur and its uses, write for Publications E-11 and E-5. If you wish, mention your particular problem so that we may send additional information.

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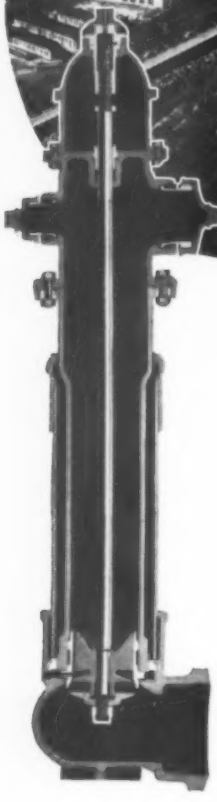
gas per day, of which 52.2 per cent was used in the power plant and the remainder consumed by plant waste gas burners. With the sewage solids overload, the original per capita allowance of 1.75 cu. ft. for sludge digestion has been reduced to 1.1 cu. ft. Two-stage elutriation is practiced. The overall wash water ratio was one volume of digested sludge to 1.4 volumes of wash water. Effective reduction based on alkalinity decrease was one volume of digested sludge to 3.0 volumes of wash water. Sludge produced totaled 23,488 tons, of which 92.4 per cent was shipped to the D.C. Dept. of Corrections at Lorton, Va. 85.6 per cent of the total power used by the plant came from sludge gas burned in an engine generator. The laboratory made approximately 15,500 routine and special analyses. Thirty-one river sampling trips were made during the year.

Operating charges were $4.87 per mil. gal., of which pumping costs amounted to $1.11 per mil. gal., and sludge shipping and cake disposal was $0.83 per mil. gal. or $1.95 per ton of vacuum filter cake produced.

GALVESTON
TEXAS

"One of America's Safest Cities"
THE MATHEWS FIREMEN SAY



THAT'S because this great island-city, "Gateway to the Southwest," is protected by Mathews Hydrants, and wherever you find these hydrants you find safety-plus.

Suppose a critically-important Mathews in Galveston should be bowled over by a truck. The hydrant could be restored to service in a few minutes, and without any excavating. For all the working parts are contained in a removable barrel, easily replaced. Water cannot reach the thread to rust it or deposit sand. The revolving nut is protected against entrance of rain and dust. The main valve is true compression-type—insurance against flooding and against strain on the internal parts.

Send for complete description about these proved guardians of life and property. Your community, the most important in the world to you, deserves the best in fire protection.

OTHER MATHEWS FEATURES: Head can be rotated 360° Replaceable head—nozzle outlets easily changed • Nozzle levels raised or lowered—no excavating • True compression-type main valve • Only one part to lubricate—operating thread • A modern barrel makes even the oldest Mathews new

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***Made by* R. D. WOOD COMPANY**

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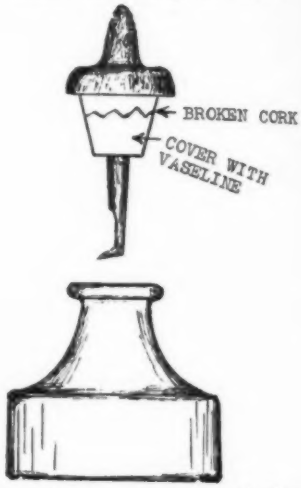
Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

Cork Kinks That Save Time and Money*

Most readers have doubtless had experience with sticking corks in all kinds of bottles. Take for example a cork such as sketched herewith, in a bottle of drawing ink. You know how, in a short time, the ink causes the cork to stick to the interior of the neck of the bottle and breakage commonly results when removing the cork.



One of the common solutions for this problem is to throw the bottle of ink away and buy a new one. But don't do that again. Apply some waterproof cement of the type that comes in collapsible tubes.

Now in chemistry it is common practice to apply vaseline to glass stoppered reagent bottles. The function of the vaseline is to make the stopper airtight and also to prevent it from sticking.

Therefore, it may be reasoned, "Why not put some vaseline on the cork of a drawing ink bottle?" The cork will cease to stick and may be removed with ease. There is less evaporation of ink than was previously the case because the vaseline makes the bottle truly air tight.

*Contributed by W. F. Schaphorst, M. E., Newark, N.J.

Data on Illinois Sewage Works

The State of Illinois, Division of Sanitary Engineering, in conjunction with the State Sanitary Water Board, has compiled a book of **Data on Municipal Sewerage Works** in that state.

By means of key letters it has been possible to compress into a small space complete information on the treatment units available, the type of sewers, and when each plant went into operation.

There is also a summary of information on the situation in the state as regards sewage treatment. A

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The result is smooth, non-turbulent flow... lowest head loss... reduced valve abrasion. Yet compact plug valve construction is retained.

a.c.f. CYLINDRICAL FULL PIPE AREA LUBRICATED PLUG VALVES

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copy of this bulletin may be obtained by writing to C. W. Klassen, Technical Secretary, State Sanitary Water Board, Springfield, Ill. Ask for Circular No. 126.

Price List of American Standards

American Standards Assoc. Inc., 70 E. 45th St., New York 17, N.Y., has just released a revised *Price List of American Standards*. The list was effective December 1.

To obtain a copy, write to the American Standards Association.

North Dakota Disaster Committee

From the *Official Bulletin* of the North Dakota Water and Sewage Works Conference we learned that the Disaster Committee of that association has prepared a questionnaire to be used in finding out what equipment every municipality in the state has for combatting disasters such as floods and fires.

When the information is completely assembled it will be distributed to all cities throughout the state. It is the purpose of this information to make it possible for any superintendent in an emergency to turn to a chart and find out exactly where he can obtain a certain piece of needed equipment.

Miss Swope Now With Argonne National Laboratory

Miss H. Gladys Swope, formerly Chief Chemist of the Allegheny County Sanitary Authority, and former Fellow at Mellon Institute, is now Senior Chemist in the Engineering Division of the Argonne National Laboratory in Chicago, working with problems in radioactive wastes.

"Where Did Those Six Years Go?"

Under the intriguing title of "Where, Oh Where Did Those Six Years Go?" the monthly house organ *Water Lines* of the Indianapolis Water Company discusses "Off Duty Time of Employees During 1947". The following quotation from that particular issue shows how good public relations efforts of management toward employees can present such dull, but important statistics, as information on off duty time of employees.

"Did you know that the average number of days lost per employee in 1947 was—seven? And the total figured up to more than six years? And that the average number of days paid for per employee was 5.27? And that the time off in dollars and cents amounted to $16,048.10 paid for, or an average of $48.93 per employee?

"The reasons why you folks were off filled 2½ pages: 119 different reasons, though undoubtedly some overlapped. Heading the list were colds, then influenza, then illness and death of relatives and friends injured on duty, and stomach disorder. Days lost ranged from 244 to 127 for the above.

"The list of reasons—to the innocent bystander—excites the imagination. 'Stung by yellow jackets' —'Went home early thru error' (did that ever work in reverse?)—'To be

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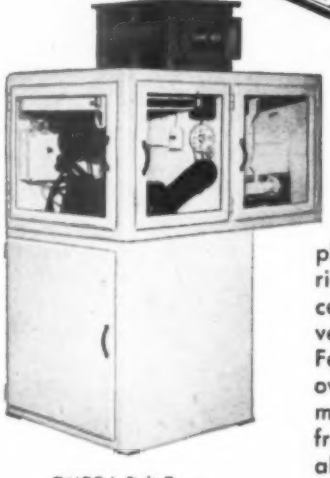

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CONCRETE PIPE
Solves Difficult Sewer and Drainage Problem

WHEN Omaha added 3½ miles of levee and concrete wall to its flood control projects, it faced three difficult sewer and outfall problems:

1. The sewer pipe had to be impervious because at flood stage the water rose to 20 ft. above the outfall. Pumps had to work against this 20 ft. head to prevent flood waters and sewage from backing up.
2. The sewer pipe had to carry industrial and domestic wastes that contained considerable abrasive material.
3. The sewer pipe had to be extra strong because many lines were under switch tracks in railroad yards and in warehouse and manufacturing areas subject to very heavy traffic.

Concrete pipe solved these problems because it has the strength to resist severe impact and to sustain heavy overburdens, because its smooth interior finish resists abrasion and provides maximum hydraulic capacity and because its uniformly dense structure and tight joints ensure minimum infiltration and leakage.

Best of all, concrete pipe is moderate in first cost and has the durability to render long years of low-upkeep service.

•

Upper photo: concrete pipe laid through levee. *Lower photo:* pipe being lowered to grouted area. Construction under supervision of Col. Louis W. Prentiss and L. C. Leavitt. Korshoj Construction Co., Parsons Construction Co. and Ace Construction Co., contractors.

AMERICAN CONCRETE PIPE ASSOCIATION
228 NORTH LA SALLE STREET, CHICAGO 1, ILLINOIS

married' (that's legit enough, but the time totalled 1.06 days and that extra half hour intrigues us)—'Unable to return from vacation because of hurricane'—and of course, just plain 'overslept.'

"There were 1160 individual absences, with colds heading the roll with 172. The relations' and friends' illness and death totaled 164, personal business—133, stomach disorder—120, and influenza—77. There were 57 reasons that had no duplication, including 'yellow jackets' and a 'misunderstood vacation schedule.' The one on 'killing hogs' really should have had the employee's name; fresh pork is so delicious.

"Almost two-thirds of the total days' lost was due to the employees' own illness; the balance for various causes, including injuries on duty which figures but 7.43% of the total."

The above is presented as another example of what can be done by a well edited house organ. *Water Lines* is written and edited by JOHN E. KLEINHENZ, in charge of publicity and advertising for the Indianapolis Water Co.

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Recent Books

Within the past year or so several books have been published on topics of interest to persons engaged in the field of water supply, sewage disposal, and industrial waste treatment.

No attempt is being made to review these books to any greater extent than to give information on what is contained therein, but herewith follows a short description of each, and how they may be obtained.

Sewerage and Sewage Treatment

"SEWERAGE AND SEWAGE TREATMENT" has been published in its sixth edition, by Harold E. Babbitt, Professor of Sanitary Engineering, University of Illinois.

The sixth edition stresses design problems, treatment methods and plant operations as opposed to construction.

Professor Babbitt has also brought the data up to date and revised his discussion of the rational method of determining runoff, and has rewritten the chapter on hydraulics as well as adding material on high-rate filters and contact aerators.

The book contains 29 chapters, an appendix on practical problems, and an appendix of references to subject matter in the field. The chapters cover design of sewer systems and treatment works, and the operation of sewage treatment plants, as well as industrial waste.

"Sewerage and Sewage Treatment," sixth edition, is published by John Wiley & Sons, Inc., 440-4th Ave., New York 16, N.Y., and retails for $6.50 a copy.

Public Health Engineering
Volume I

Volume 1 of PUBLIC HEALTH ENGINEERING, by Earle B. Phelps, Professor Emeritus of Sanitary Science at Columbia University and Professor of Sanitary Science at the University of Florida, has just been published by John Wiley & Sons, Inc.

Professor Phelps, who is a pioneer investigator and authority on sewage chemistry, stream sanitation, and other phases of sanitary science, has written this volume primarily for municipal and civil engineers in an effort to indicate what should be designed and built and why it should be built in order to protect public health. Written in the light of present day sanitary science, the approach is through chemistry and the biological

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sciences, which makes it valuable also for medical health officers. The subject matter is divided into two parts—(1) a discussion of the air contact, broadly defined to include atmosphere pollution from smoke, odors and noise, ventilation, illumination and insect problems; and (2) a discussion of water contacts, including the uses and abuses of water resources, stream sanitation, sewage treatment and the conservation of water supply. Volume II, to be published later, will deal with the human environmental contact, food, etc.

PUBLIC HEALTH ENGINEERING, Vol. I, is published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y., and retails at $7.50 a copy.

Bulletin On Reservoir Sedimentation

The Ohio Water Resources Board, 553 Broad Street, Columbus 15, Ohio, has issued a report which summarizes all known available data pertaining to the rate of accumulation of sediment in lakes, reservoirs and ponds in that state. These studies are the results of observation conducted by the U.S. Soil Conservation Service, the U.S. Engineers, and the Ohio Division of Conservation.

Quantitative data and descriptions of surveys made on 28 lakes and reservoirs are included in the report which is published for the purpose of determining the rate of accumulation of sediment in reservoirs and the resulting effect on storage capacity, aquatic life and the economic and esthetic values of the reservoirs.

To obtain a copy of Bulletin 17 titled "Sedimentation of Reservoirs in Ohio" write to Earl E. Sanderson, the author, at the above address.

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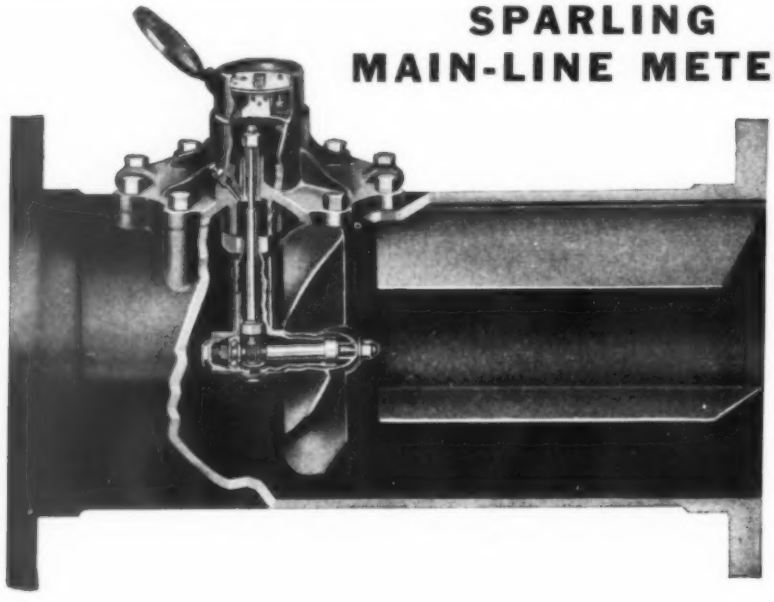

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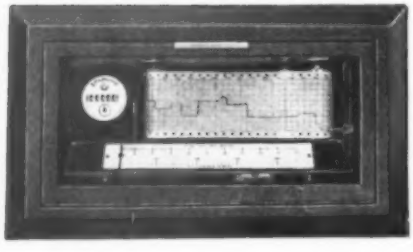

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Current Waterworks Practice

"CURRENT WATERWORKS PRACTICE" is the title of a book by W. H. Maxwell, Consulting Waterworks Engineer, of London, England.

This book is prepared as a practical treatise on the provision of water supplies for both urban and rural communities. The book contains 15 chapters and 4 appendixes. Included in the main part of the book are chapters on underground water sources, and current methods of water purification. In reference to construction of water supplies are chapters on the selection of electric motors for pump-drives, concrete work, and practical arts regarding the construction of reservoirs, towers, dams, etc. There are chapters on automatic control of pumps, recent development in waterworks practice, national water policy, jointing and sterilization of mains and the effect of aerial war upon the design of water works structures. Appendixes contain information on laws regarding water supplies and sewerage, ministry of health circulars, etc. One appendix contains data on water equivalents, etc.

The book contains 254 pages, is published by B. T. Batsford Ltd., 15 North Audley Street, W.1, London, England, and retails for 18 shillings net.

Scientific and Technical Abbreviations, Signs, and Symbols
(New Book)

In one single volume, O. T. Zimmerman, Ph.D., and Irvin Lavine, Ph.D., have presented thousands of abbreviations, signs, letter symbols, graphical symbols in numerous technical fields. The fields covered include engineering, mathematics, chemistry, statistics, acoustics, railway, thermodynamics, machine shop,

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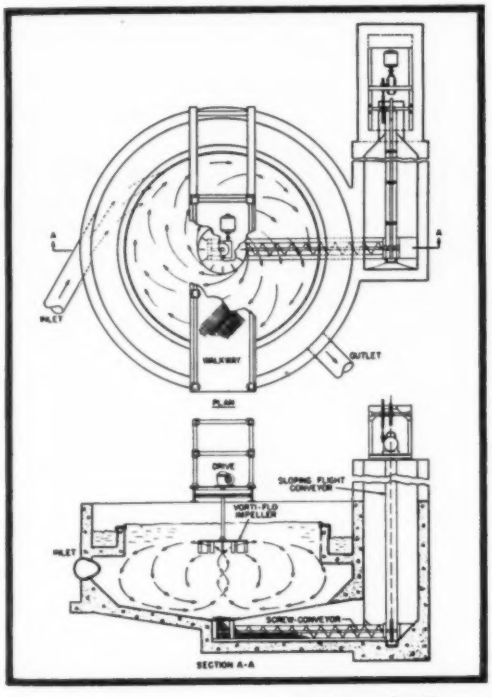

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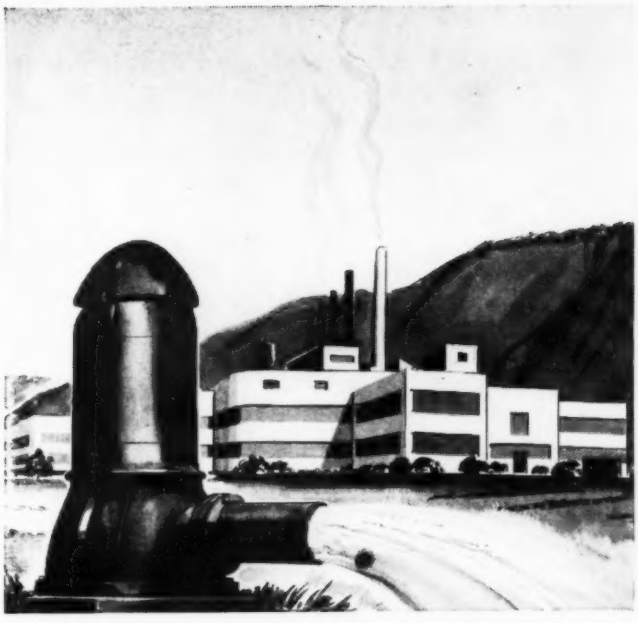

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military, physics, botany, zoology, shipping, hydraulics, communications, meteorology, aeronautics, medicine, commerce, banking, electronics, astronomy, humidity, radiation, magnetics, illumination, mapping, and drawing.

Persons who read or write scientific articles, who prepare engineering reports, drawings, charts, maps and graphs, or who teach scientific subjects will find this book a time saver and help.

Published by the Industrial Research Service, Masonic Bldg., Dover, N.H., the book "SCIENTIFIC AND TECHNICAL ABBREVIATIONS, SIGNS AND SYMBOLS" contains 480 pages (5⅜ x 8⅜ in.) is cloth bound, contains 69 tables, over 3,000 graphical symbols and is sold for $7.00 a copy.

Zoo Lion Bites Water Hose, Nearly Drowns

Rory, a lion in the Glasgow, Scotland zoo, saw a snake in his cage and bit it. But it wasn't a snake, it was a garden hose. The hose stuck in his throat and the water rushing from the holes that his teeth had made nearly drowned the lion. It took fifteen minutes of artificial respiration to revive him after the water was turned off.

The moral of this little story is, "what sometimes looks like, ain't."

Water Quality Criteria Potomac River Basin

The Interstate Commission on the Potomac River Basin has issued a bulletin entitled "Water Quality Criteria." The bulletin describes the work of the Interstate Commission on the Potomac River, its composition and membership, and discusses conditions of the Potomac River Basin, land and water uses in the Basin, water quantities in the Basin, and water qualities.

Of particular importance is the setting forth of the "Minimum Water Quality Criteria for Streams in the Potomac River Basin." These criteria cover such items as bacteria, color, turbidity, pH, dissolved oxygen, and other conditions for Class A, Class B, Class C and Class D waters. An explanation of the criteria is also given, and the minimum criteria are set up by classes and a table.

To obtain a copy of this bulletin, write the Interstate Commission on the Potomac River Basin, 202 Transportation Building, Washington 6, D.C.

That Bacteriological Ball

A gay bacillus to gain her glory,
Once gave a Ball in a laboratory.
The fete took place on a cover glass,
Where vulgar germs could not harass.

None but the cultured were invited,
For microbe chicks are well united.
They closely shut the Ballroom doors,
To all the germs containing spores.

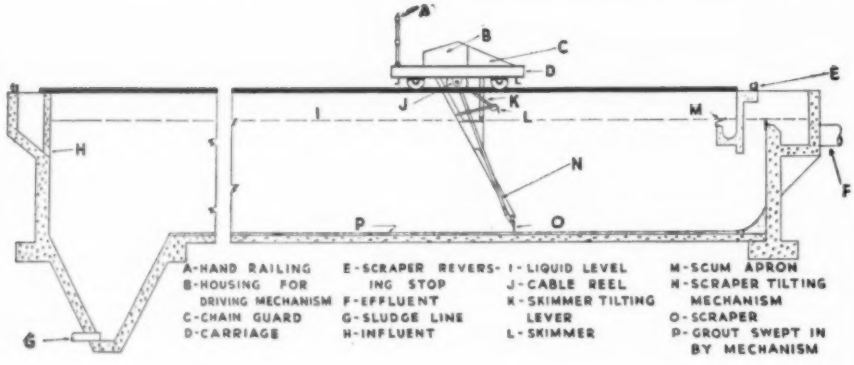
The Staphylococci first arrived,
To stand in groups they all contrived.
The Diplococci came in view,
A trifle late and two by two.
The Streptococci took great pains
To seat themselves in graceful chains.
The Pneumococci, stern and haughty,
Declared the Gonococci naughty
And said they would not come at all
If the Gonos were at the Ball.

Each germ enjoyed himself that night
Without fear of a Phagocyte.
T'was getting late and some were loaded,
When BANG, a chlorine cylinder exploded!
And gassed the happy dancing mass
That swarmed the crowded cover glass.
Not one survived but perished all,
At that ill-fated Bacteriological Ball.

—Anon., *"ISAWWA News"*

Conserve Space with . . .

HARDINGE RECTANGULAR CLARIFIERS



In sewage or water treatment plants where space is limited, or where sludge delivery is desired at one end of the tank—the Hardinge Rectangular Clarifier provides a compact, efficient unit.

A traveling bridge crane spans the tank and supports a sludge scraper. This mechanism moves automatically along the tank, scraping all settled solids into sludge hoppers at one end.

Write for Bulletin 35-C-15 and give us pertinent details of your treatment problem.

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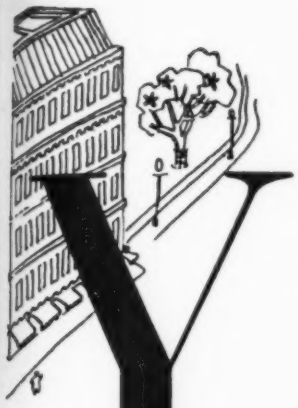

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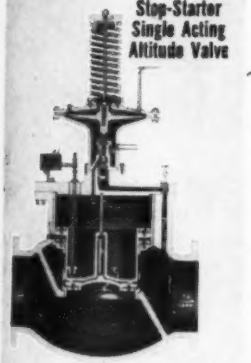

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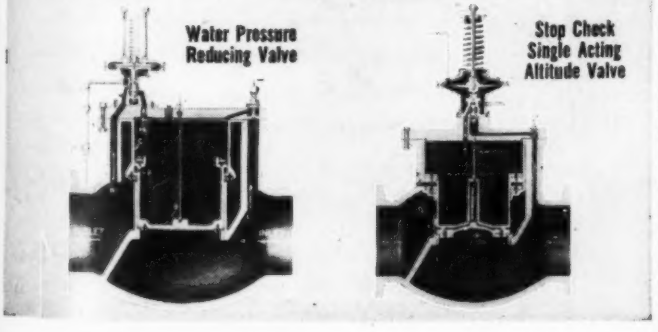

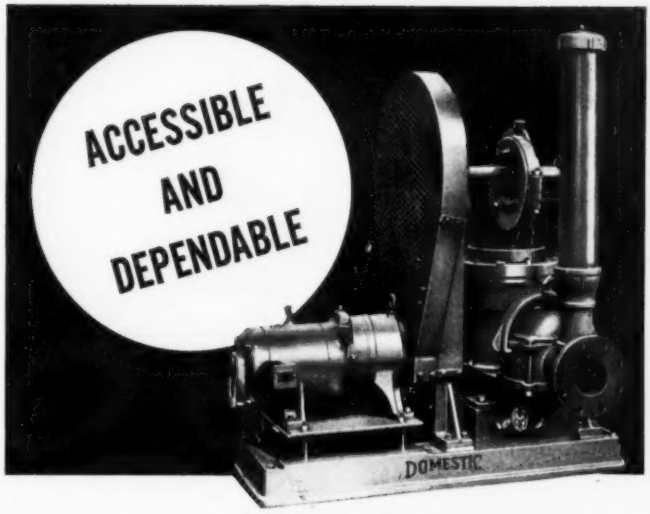

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All sizes 5½" stroke, adjustable eccentric type.

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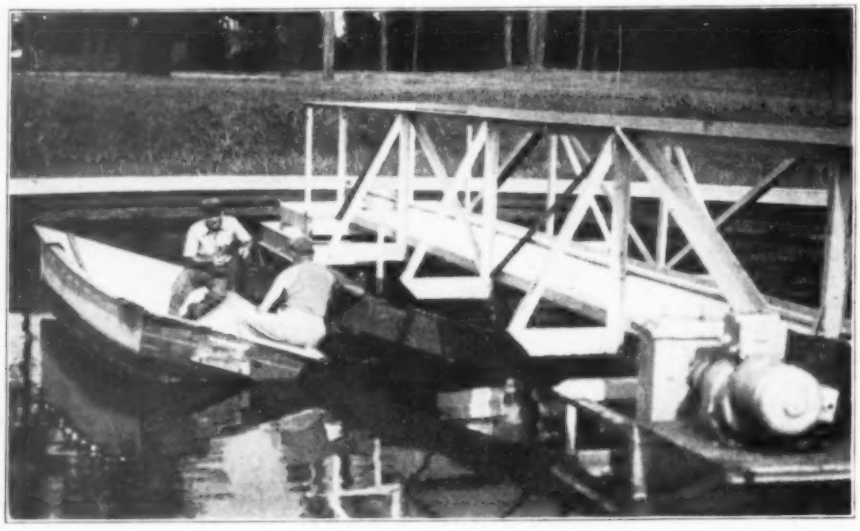
Floating Scaffold For Clarifier Maintenance

George A. Rhame, Sanitary Engineer (sewage) of Ft. Jackson, S.C., has submitted the accompanying photograph of a floating scaffold used for clarifier maintenance.



Mr. Rhame points out that the danger of serious falls of treatment plant personnel engaged in clarifier maintenance at the Ft. Jackson, S.C., Sewage Treatment Plant has been practically eliminated by substituting a boat for the usual scaffolds or slings. Working height is easily adjusted by regulation of the depth of water in the tank.

This particular boat was loaned by courtesy of the Insect and Rodent Control Section to the Sewage Treatment Plant at Ft. Jackson. It would appear from inspection of the photograph that a round bottom narrow boat would not be very useful for this purpose.

Green Bay Suburb Has New Pumping Station

Although Green Bay, one of the larger cities in northern Wisconsin, has an excellent water works system, the town of Preble, adjoining the city, has its own water works. A new pumping station was completed and went in service starting in June. The township water system now serves 952 residences, 72 commercial, and 26 industrial customers. One of the industrial customers, a packing house, uses about one-half of all of the water pumped at the Preble water works.

The reservoir is about 44 ft. in diam. and 14 ft. in height, with a capacity of 175,000 gals., and is built partially above ground. The water supply comes from two wells: No. 1 well is 973 ft. deep and 12 in. in diam., with a static head at 250 ft.; Well No. 2 is 1007 ft. deep, 10 in. in diam., with a static head of 220 ft.

The distribution system totals about 20 miles, consisting of 12, 10, 8, 6, and 4 in. mains, and 15,000 ft. of new mains are being laid. There are two ground reservoirs, one for each pumping station, both of 175,000 gal. capacity, and there is also a standpipe of 100,000 gal. capacity. The

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...of a Superior COAGULANT

SEVEN ADVANTAGES OF FERRI-FLOC

1. Coagulation is effective over a much wider pH range than with other coagulants. Color flocs may be formed in the very acid range where other coagulants may not be employed. On the other hand, true hydrated ferric oxide flocs may be formed at pH 9-10 or even higher for the removal of turpidity and manganese.
2. The time required for floc formation, conditioning and settling is in many cases considerably shorter than that required for other coagulants.
3. Filter runs have been markedly increased in several cases.
4. Manganese is successfully removed at pH values above 9.
5. Effluents may be produced which are exceedingly low in both iron and aluminum.
6. Hydrogen Sulphide is removed and taste and odors improved.
7. Ferri-Floc does not seem to stick to sand grain to form mud balls, and is subject to less "breaking through" on the filters.

Let us send you FREE, this valuable booklet on Ferri-Floc.
Write TENNESSEE CORPORATION,
Grant Bldg., Atlanta, Ga.

Many of the country's larger plants are now recognizing the advantages offered by Ferric Coagulants and are taking advantage of them through Ferri-Floc. — Ferri-Floc eliminates the troubles encountered with other coagulants by improving general quality, reducing overall cost. — All of this is accomplished without costly changes in plant equipment.

TENNESSEE CORPORATION
Atlanta, Georgia — Lockland, Ohio

new pumping station has a capacity of about 700,000 gal. of water per day, while the old one is good for about 400,000 gal.

Superintendent Clyde F. Cormeier says: "We are right next to Green Bay city limits, and we have a cross connection with the Green Bay water system, so that we can get water from that source in an emergency. However, it is against the rules of the City of Green Bay to serve any customers outside of its city limits, except in an emergency. When other sections of Preble township become populated, water from the Preble water works can be pumped to such districts when needed."

Cormeier states that the water from the Preble wells has a fluorine content about the same as the water from the Green Bay wells, i.e., about 2.5 ppm.—*J. E. Hubel.*

MANUFACTURERS' *and* EQUIPMENT NEWS

Stuart Corp. Reappointed National Distributor for Palmer "Filter Sweeps"

Stuart Corporation of Baltimore, Md., has been reappointed National Distributor for the Palmer Surface Wash System for another six years in accord with the renewal of existing contracts with Palmer Filter Equipment Co. of Erie, Pa., fabricators of this equipment.

Stuart Corporation has reappointed the following as sales agencies for this equipment:

Infilco, Incorporated—Chicago

Roberts Filter Mfg. Co.—Darby, Pa.

E. W. Bacharach & Co.—Kansas City

Cochrane Corporation — Philadelphia

W. D. Taulman and Associates—Atlanta

Sherman Machine & Iron Works—Oklahoma City

Builders-Providence, Inc.—Providence

The Refinite Corporation—Omaha

Liquid Conditioning Corp.—Linden, N.J.

The existing popularity of the Palmer Surface Wash System is revealed by the fact that Stuart Corporation reports that only recently 14 municipalities and industrial plants have selected the "Filter Sweep" for effective filter bed washing, and four large cities have specified this method of filter washing in their plant betterment programs.

Hiller Advanced at Innis, Speiden

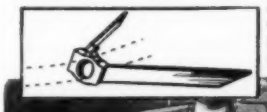
Paul W. Hiller, special representative for Innis, Speiden & Co., New York City, has been appointed manager of the company's newly-formed Products Development Department.

Mr. Hiller has been associated with the chemical industry for 31 years and has been with Innis, Speiden & Co. since 1919. He has been active in American Chemical Industry, Inc., and is now secretary of that organization. He is also well known in the water and sewage works field.

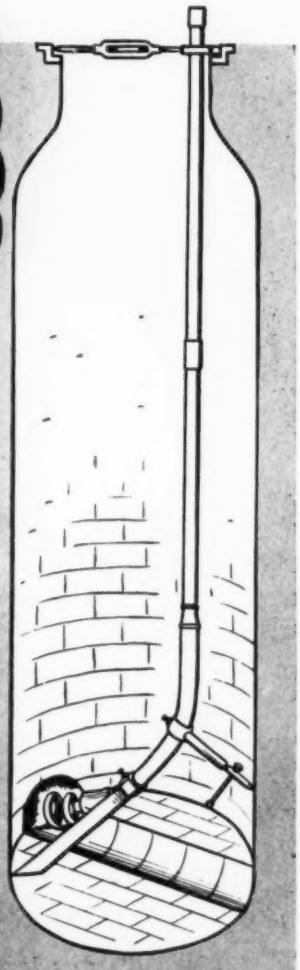
NEW—"FLEXIBLE" LOWER MANHOLE JACKS SAVE TIME AND WORK AND EQUIPMENT

"FLEXIBLE" experience again provides new methods of simplifying tough jobs. These two new Lower Manhole Jacks brings sewer and line cleaning operations another step further into the open. They also speed tool changing. Note how the coupled rod guide is quickly, firmly, simply anchored at the bottom of the manhole. Also note that the face of the bell is held *away* from the lip of the sewer line itself. This enables operators to see roots before they jam tight in the rod guide.

Adjustable Back Jack (Optional use). Perfect for getting additional anchorage of rod guide. Sold separately.



Adjustable Foot Jack. Ideal for use with proven "Flexible" Steel Rod system of cleaning sewer lines. Sold separately.



Lower Manhole Jacks in position. Clear working face of sewer is provided as well as comfortably small amount of rod bend into sewer line.

ASK YOUR NEAREST "FLEXIBLE" OFFICE TODAY FOR FULL INFORMATION

FLEXIBLE SEWER-ROD EQUIPMENT CO.

9059 Venice Blvd., Los Angeles 34, California

141 W. Jackson Blvd. Chicago, Ill. · 401 Broadway New York 13 · 147 Hillside Ter. Irvington, N. J. · P. O. Box 165 Atlanta · 2011 Central Ave. Memphis, Tenn.

801 E. Excelsoir Blvd. Hopkins, Minn. · 29 Cerdan Ave. Roslindale 31, Mass. · P. O. Box 447 Lancaster, Texas · 41 Greenway St. Hamden, Conn.

3786 Durango Ave. Los Angeles 34, Calif. · 909 N. Homewood Ave. Pittsburgh 8, Pa. · 4455 S.E. 24th Ave. Portland 2, Ore.

L. S. Olding Honored for Service

L. S. Olding was tendered a luncheon during the meeting of the California Section of A.W.W.A. This luncheon was in recognition of his 28 years of service with the National Water Main Cleaning Co. A service emblem to commemorate this 28-year period was presented to him by J. A. Frank, Vice Pres. and Gen. Mgr. of the National Water Main Cleaning Co.

R. H. Morse Pres. DEMA

Robert H. Morse, Jr., vice president in charge of operations of Fairbanks, Morse & Co., was elected president and treasurer of the Diesel Engine Manufacturers' Assoc. (DEMA) at its recent annual meeting.

Harvey T. Hill was reappointed executive director and enters on his fifth year of service at that post.

200

Verticlosed Pump Motor

U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif., has developed a new deep well vertical pump motor. Called the Verticlosed Streamway motor, it embodies several new features and is designed for application to practically all types of turbine pumps.

Included in the new features are complete streamlining, with an interchangeable base to permit increase or decrease in horsepower without the expense of re-machining or exchanging the pump head; a waterproof housing protects vital parts of the motor; downdraft ventilation prevents re-entry of expelled hot air; and flush-style oil gauges are made with Lucite windows.

To obtain further information on this new pump motor, use a Reader Service Card on which is entered the above key number and your name and address.

Rankin of Dorr Co. to Europe for Three Months

R. S. (Steve) Rankin, assistant manager of North American Sales for The Dorr Co., in charge of sanitary engineering work, has gone to Europe for a three months' visit to Great Britain and the Continent.

During his stay abroad he will inspect sewage and water treatment plants in various countries which the

THEY TELL ME THE PARTS IN THIS WATER METER ARE INTERCHANGEABLE -
YES, AL, THAT'S TRUE. OUR BUFFALO METERS ARE FULLY INTERCHANGEABLE -- PART FOR PART, NOT JUST UNIT ASSEMBLIES !
● The individual parts . . . measuring chamber halves, gears, bearings, and all internal parts in AMERICAN and NIAGARA Water Meters have been *fully interchangeable* for many years . . . cutting maintenance costs to a minimum.
AMERICAN BRONZE CASE
NIAGARA GALV. IRON CASE
WATER METERS
BUFFALO METER COMPANY
2909 MAIN STREET, BUFFALO 14, N. Y.

company serves and confer with associates in London, Amsterdam, Brussels, Paris, and Milan.

Oldroyd Sales Mgr. Oakite's Indus. Div.

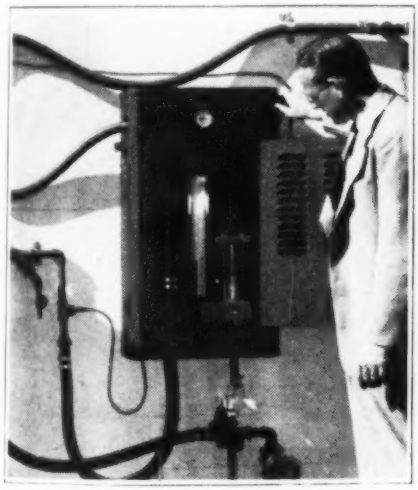
Announcement has been made by Oakite Products, Inc., of New York of the appointment of Frank L. Oldroyd as sales manager of its Industrial Division.

Mr. Oldroyd has been associated with the company for more than 15 years, and prior to his recent appointment was special field sales manager.

201

Chlorinator

Shown in the accompanying photograph is a Paddock High Capacity Chlorinator as produced by the Paddock Engineering Co. of 3727 Atwell St., Dallas 9, Texas. This is the same company which



makes the SureClor automatic chlorinating unit, recently reported in these columns. This High Capacity Chlorinator may be obtained in rated capacities up to 1000 lb. per 24 hr. with a meter accuracy of 4 per cent.

For further information use a Reader Service Card on which is entered the above key number and your name and address.

Preload Corp. Changes Location

The Preload Corp. has announced the removal of their office to 211 E. 37th St., New York 16, N. Y.

Chain Belt Co. Has Atlanta Warehouse

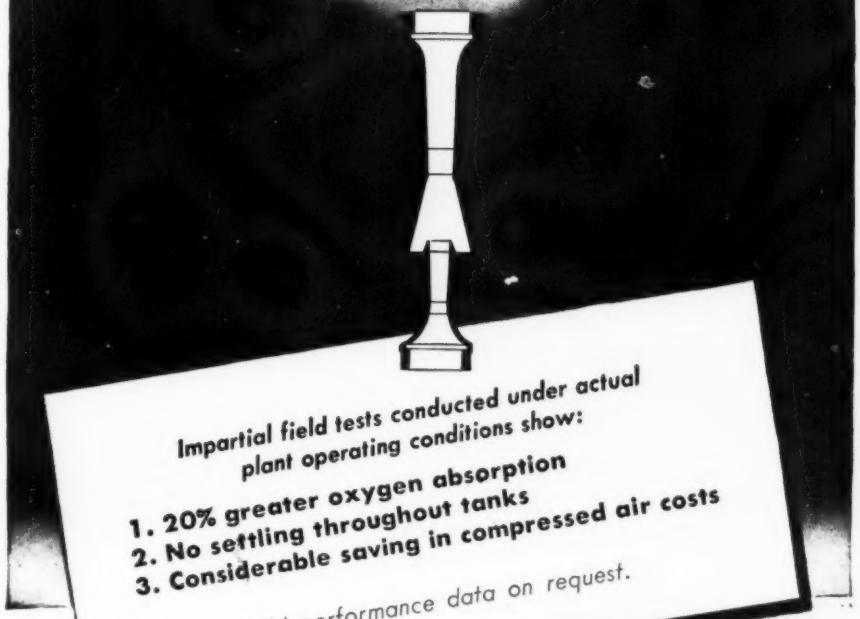
Chain Belt Co. of Milwaukee, Wisc., has announced the establishment of a new Atlanta warehouse at 878 Ashby St., N.W., Atlanta, Ga. The Atlanta district office will also be located at this address under the direction of J. S. Moore, District Manager. The new warehouse will be under the supervision of G. J. Schuelke, formerly of the Milwaukee office.

Walker Process Equipment Co. Moves

The engineering offices, laboratories, and plant facilities of Walker Process Equipment Co. have recently been moved into a new building at 518 Hankes Ave., Aurora, Ill.

You, too, can IMPROVE PLANT EFFICIENCY ...REDUCE MAINTENANCE COST *with American*

JET AERATION



Impartial field tests conducted under actual plant operating conditions show:

1. 20% greater oxygen absorption
2. No settling throughout tanks
3. Considerable saving in compressed air costs

Field performance data on request.

Our staff of Sanitary Engineers will cooperate with consulting and operating engineers in suggesting the process of treatment and type of equipment best suited to individual needs.

AMERICAN WELL WORKS

IN OUR 80TH YEAR

108 North Broadway
AURORA, ILLINOIS

Pumping, Sewage Treatment, and Water Purification Equipment
RESEARCH · ENGINEERING · MANUFACTURING

Offices: Chicago • New York • Cleveland • Cincinnati • Kansas City • Sales Representatives throughout the World

H. M. Olson Joins Morton Salt Co. as Consultant

Harold M. Olson, who has been Maintenance Engr. of the Ohio Salt Co. for many years and has been in the field of water treatment engineering for 39 years, has joined the Morton Salt Co. as of Jan. 1 of this year.

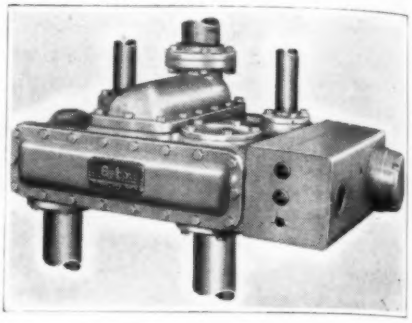
In his new position as Consulting Maintenance Engineer for the Morton Salt Co., Mr. Olson will be available through the company for consultation on new projects and trouble shooting in the ion-exchange field or equipment in service.

Mr. Olson will continue his work in the field of municipal and industrial water softening, and will continue his activities as General Chairman of the Annual Industrial Water Conference of the Engineers' Society of Western Pennsylvania, as he has since its inception in 1940.

202

Multiport Valve

Belco Industrial Equipment Div., Inc., Paterson 3, N.J., has announced the development of a new *Multiport Valve* for use with either old softeners and filters or new installations of zeolite softening equipment.



For further information on this new unit, use a Reader Service Card on which is entered the above key number and your name and address.

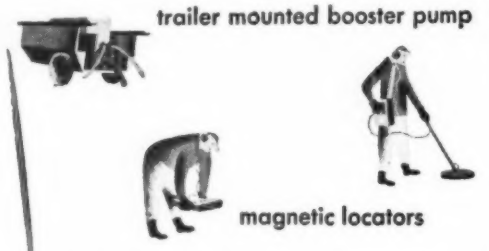
203

Photoelectric Colorimeter

Photovolt Corp., 95 Madison Ave., New York 17, N.Y., has a new Photoelectric Colorimeter of high accuracy, designed particularly for the measurement of color and turbidity of water, for colorimetric tests in the sanitary examination of drinking water, sewage, and industrial wastes.

To obtain further information on this unit, use a Reader Service Card on which is entered the above key number and your name and address.

all this and radio too,

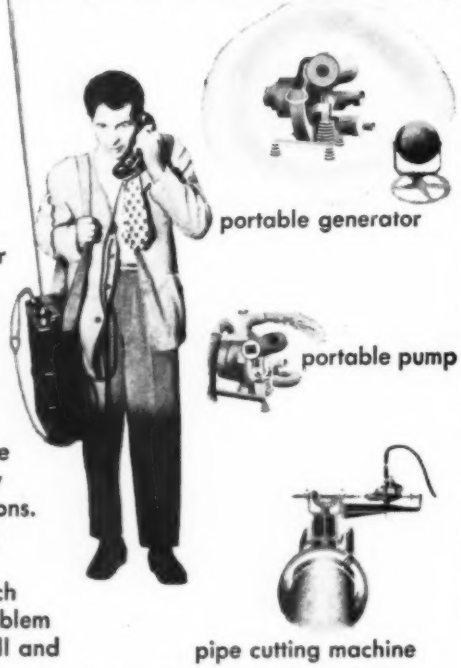


helps NATIONAL clean water mains faster, better and more economically

The highly specialized equipment employed by the National Water Main Cleaning Co. today includes: walkie-talkie radio systems for maintaining constant communication between the point of operation and control valves or pumping stations, magnetic locators for tracing underground pipe, truck-mounted pumps for dewatering, trailer-mounted booster pumps for stepping-up pressure, pipe cutting machines and a tremendous variety of cleaning heads developed to meet the requirements of varying pipe sizes, conditions and layouts.

Even more important than adequate equipment is the experience necessary to cope with all conditions and situations. The nature of the obstruction, varying pipe sizes, unusual pipe layouts, the character of the water — all make each cleaning assignment an individual problem calling for specialized experience, skill and equipment.

We'll be glad to check the condition of your water mains, recommend the required treatment and estimate the cost of National Water Main Cleaning service. Write today.

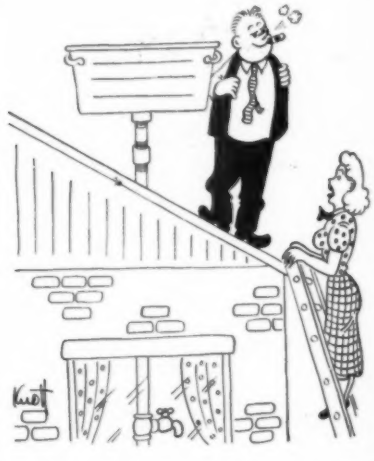


NATIONAL WATER MAIN CLEANING COMPANY

50 Church Street, New York 7, N.Y.

28

ATLANTA, 1221 Mortgage Guarantee Building • BOSTON, 115 Peterboro Street • CHICAGO, Room 1336, 122 So. Michigan Avenue • HOUSTON, 2518 Grant Street • KANSAS CITY, 421 BMA Building LOS ANGELES, 448 South Hill Street • MEMPHIS, 822 Dermon Building • OMAHA, 3812 Castellar Street • RICHMOND, 210 East Franklin Street • SPRINGFIELD, MO., 844 North Main Street • SALT LAKE CITY, 149-151 W. Second So. Street • SAN FRANCISCO, 681 Market Street • MONTREAL, 2028 Union Ave. • VANCOUVER, B. C., 505 West 1st Ave. • WACO, P. O. Box 887 • WINNIPEG, 576 Wall Street • HAVANA • MAYAGUEZ, PUERTO RICO • BOGOTA • CARACAS • MEXICO CITY



"A very clever idea to save on water, Edgar, —but do you think it will rain enough?"

3 way dependability

1. **IN CASE OF FIRE**—dependable, smooth operation . . . clear, large waterways . . . insure plenty of water. Hydrants open fast and easily *with* the pressure . . . and close without water hammer.
2. **IN CASE OF ACCIDENT**—stem held in place below main valve means no water loss due to a bent stem. One man can easily remove all operating mechanism for inspection or repairs.
3. **IN CASE OF LOW TEMPERATURES**—Eddy's positive drip action automatically drains hydrant barrel of all water when hydrant is closed . . . safeguards hydrant against freeze-ups.

EDDY
VALVE COMPANY
WATERFORD NEW YORK
A subsidiary of James B. Clow & Sons

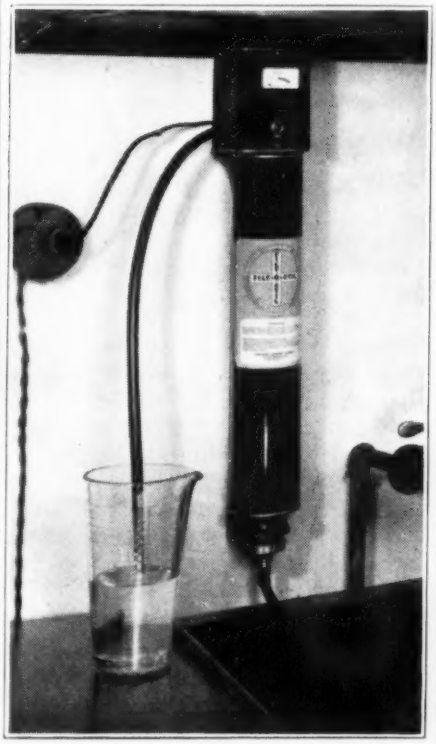
Roberts Filter Quarter Century Club

Following the 50th anniversary banquet of the Roberts Filter Mfg. Co. of Darby, Pa., the Quarter Century Club was organized within the company. The club consists of sixteen charter members who have served the company from 25 to 40 years in the office, shop, or field. At a recent meeting Fred H. Lawrence was elected president and Percy Foster Jr., secretary. The club has also elected to honorary membership Charles V. Roberts and John D. Roberts, president and treasurer respectively of the company.

204

Cartridge Demineralizer

The Ion Exchange Products Dept. of American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N.Y., has developed a redesigned



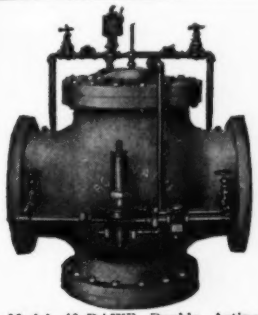
Filt-R-Stil cartridge demineralizer for delivering the low cost chemical equivalent of distilled water at a maximum rate of ten gallons per hour. One cartridge will produce at least 550 gal. of demineralized water from a two grain per gal. supply, or 220 gal. from a five grain per gal. supply.

To obtain further information on this new unit, use a Reader Service Card on which is entered the above key number and your name and address.

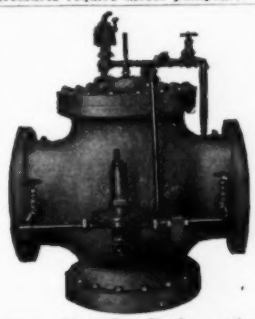
Est. 1879

ROSS AUTOMATIC VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

The SEWER SCOOTER

(U. S. Patent 2,198,823)

THE ONLY 100% SELF-PROPELLING SEWER CLEANER

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

A patented feature

No Preliminary Work—
Gets Results in a Hurry

SEWER SCOOTER MODEL A-3, BRONZE

Standard machines stocked 8 inches to 96 inches—For sale, rent or contract.

J. C. FITZGERALD

Box 289-A
Coral Gables 34, Fla.

LITERATURE AND CATALOGS

205

VACUUM FILTRATION

The Eimco Corp., Salt Lake City 8, Utah, has issued a four-page folder on vacuum filtration. The folder is titled **A Better Place to Live—Through Vacuum Filtration,** and shows a flow sheet of various types, showing wherein each vacuum filter would fit.

This highly interesting folder may be obtained by using a Reader Service Card on which is entered the above key number and your name and address.

206

ELEVATED TANK STORAGE

R. D. Cole Manufacturing Co., Newnan, Georgia, has published a book entitled **Tank Talk,** on the subject of elevated steel tanks for water supply. The book is complete with pictures of all sizes, types and designs of elevated water tanks as manufactured and installed by the R. D. Cole Co.

To obtain a copy of this book on Tank Talk, use a Reader Service Card on which the above key number is entered, along with your name and address.

207

VALVES AND FITTINGS

The M & H Valve & Fittings Co., Anniston, Ala., has issued Catalog No. 34 on the M & H Line of **Water Works and Sewage Disposal Equipment and Accessories.** The 44-page bulletin contains information on the design, construction and operation of gate valves, tapping valves and sleeves, valve boxes, floor stands, check valves, fire hydrants, shear gates, mud and flap valves, sludge shoes, flange and flare fittings, wall castings, bell and spigot fittings, cutting-in tees, etc.

To obtain a copy of this bulletin on Water and Sewage Works Equipment and Accessories, use a Reader Service Card on which is entered the above key number and your name and address.

208

pH CONTROL

Beckman Instruments, National Technical Laboratories, in South Pasadena, Calif., has issued a small folder on **pH in Water Treatment and Sewage Disposal.**

This little bulletin contains a discussion of pH control, its use in water treatment and in waste disposal work, and its determination.

Information on automatic pH equipment is included along with a discussion of the advantages of Beckman pH equipment.

To obtain a copy of this highly interesting and informative booklet, use a Reader Service Card on which is entered the above key number and your name and address.

209

HEAT EXCHANGER

The Dorr Co., New York City, has available a four-page catalog on **The Spiral Heat Exchanger.** This catalog is produced by the American Heat Reclaiming Corp., 1270 Sixth Ave., New York 20, N. Y.

This is the Spiral Heat Exchanger which The Dorr Co. is offering for

No. 2V-APCO

APCO-V-APCO PRIMERS

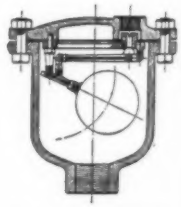
AUTOMATIC POWER OR TANK PRIMERS

AIR RELEASE VALVES

FOR

FILTER PIPE LINES—DISTRIBUTION LINES
AND OTHER USES

17 TYPES



No. 200 VALVE

VALVE AND PRIMER CORPORATION 127 N. Dearborn St., Chicago 2, Ill.

use as an external heat exchanger for sludge digestion tank heating.

To obtain a copy of this bulletin which shows the design and operation of the exchanger, use a Reader Service Card on which is entered the above key number and your name and address.

210

CHLORINATOR

Paddock Engineering Co., 900 South Ervay, Dallas 1, Texas, has issued a bulletin on the **Paddock High-Capacity Chlorinator.** This unit, for the treatment of domestic and industrial waste supplies and diagrammatic drawings is described in the bulletin. The unit is described as a high-capacity, but inexpensive chlorinator for the treatment of domestic and industrial supplies.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

211

WELL SCREENS

Edward E. Johnson, Inc., 2304 Long Ave., St. Paul 4, Minn., has just issued a catalog on **Johnson Well Screens.** These screens for both large and small wells are completely described in the catalog.

The function of a well screen and its method of use are completely presented in this informative catalog which discusses such other matters as installation, developing sand and gravel wells, methods of gravel treating wells, and, of course, information on sizes, capacities, and prices of the equipment.

Persons interested in well ground waters and their development should have this catalog in their files. To obtain a copy, enter the above key number and your name and address on a Reader Service Card, and mail.

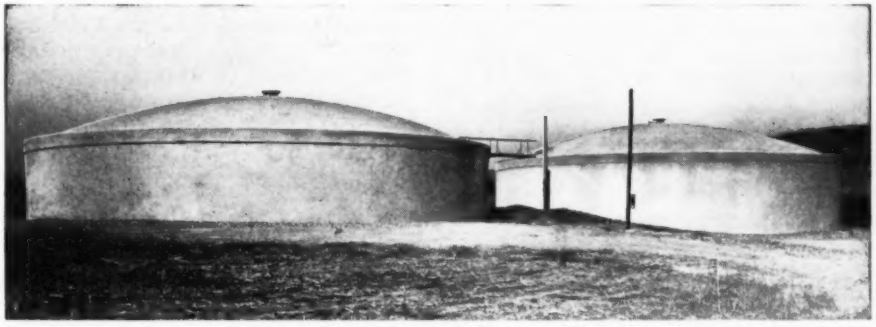
212

SEWAGE PUMPS

Worthington Pump & Machinery Corp., Harrison, N.J., has available a bulletin on **Worthington Freflo Pumps.** These are centrifugal pumps for pumping sewage and industrial waste and the bulletin describes horizontal and vertical types; performance curves are given, as are sectional drawings of the pumps, and data on shafting required.

To obtain a copy of this bulletin on sewage pumps, enter the above key number on a Reader Service Card together with your name and address and mail.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.



PRE-STRESSED "GUNITE" TANKS

Above are shown two 80' diameter 750,000 gallon prestressed "GUNITE" water storage tanks with "GUNITE" dome roofs. We built these tanks in 1943 for the Borough of Schuylkill Haven, Penna.

Prestressed "GUNITE" produces a water storage tank which is bottle tight and maintenance free. They may be built either at ground level, completely underground with earth covering over the dome roof, or may be in the form of stand-pipes or elevated tanks.

Our experience in this field includes scores of tanks and silos of many types ranging up to two and one-half million gallons capacity.

Our 64 page Bulletin C2400 describes this method of construction fully and also other uses of "GUNITE."

Write for your free copy of Bulletin C2400 today

MANUFACTURERS OF THE "CEMENT GUN"

COMPLETE WATER ANALYZER

Fast-Easy-

Low Cost

There's the Value!

Taylor Water Analyzer

for determinations of

pH, COLOR, MANGANESE, TOTAL IRON, AMMONIA, CHLORINE, SILICA, COPPER, NITRATE N, NITRITE N, FLUORIDE

. . . all of these vital analyses can be made simply and accurately by anyone. No delicate single standards to handle. A single plastic slide permanently encloses nine Taylor Liquid Color Standards (a complete set for any one determination). All Taylor Liquid Color Standards carry an unlimited guarantee against fading. All Taylor slides fit the one base.

FREE—INFORMATIVE BOOKLET!

Write direct for "Modern pH and Chlorine Control"—96 pages of valuable data for all men concerned with water purification problems. Tells how Taylor sets make determinations easily, simply, quickly. Illustrates and describes all Taylor sets. See your dealer for equipment.

W. A. TAYLOR AND CO.
7308 YORK RD. • BALTIMORE-4, MD.

LEADITE
The Pioneer Self-Caulking Material for C.I. Pipe

4 REASONS
why more miles of cast iron water mains are jointed with LEADITE than with any other melted self-caulking material:

- MELTS EASILY
- GOES FARTHER
- SAVES TIME, LABOR, COST OF MATERIAL
- MAKES A GOOD TIGHT JOINT THAT IMPROVES WITH AGE!

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia 2, Pa.

No Caulking

MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

KNOWN AROUND THE WORLD AS THE SIGN OF EXCELLENCE IN WATER TREATMENT EQUIPMENT

The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

GRAVITY FILTERS • SOFTENING PLANTS AND EQUIPMENT • PRESSURE FILTERS ZEOLITE SOFTENERS • SWIMMING POOL RECIRCULATING APPARATUS SPECIAL WATER TREATMENT EQUIPMENT

We invite your inquiries

ROBERTS FILTER MANUFACTURING COMPANY • *Darby, Pa.*

MAKES WATER BRIGHT

AND BETTER TASTING TOO!

STUART CORPORATION BALTIMORE

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1 Low head chemical pump with motor direct connected.
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1 Cylindrical steel tank, capacity 4500 gallons, rubber lined for handling ferric chloride, with 7/16 inch shell plates and ½ inch head plates.

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213

SEWAGE SUMP PUMPS

The Gorman-Rupp Co., Mansfield, Ohio, has available a 4-page folder, describing its **Self-priming Sewage Sump Pumps.** This is a non-clogging, centrifugal sump pump that is of particular importance in the field of sewage handling. The pumps are made for close-coupled, flexible couplings, and driven by gasoline engine or V-belt.

To obtain this bulletin describing this unique new pump, use a Reader Service Card on which is entered the above key number and your name and address.

214

SEWAGE SCREENING AND CUTTING

Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill., has issued a new bulletin on the new improved **Griductor.** This unit is designed primarily to cut larger sewage solids in a normal sewage stream by screen and grid action, thus protecting plant equipment, such as pumps, clarifiers and distributors. The bulletin points out the basic advantages in the Griductor, the ease of installation and the elimination of special forms of complicated concrete work. The bulletin explains the special low cost operating factor as it is achieved by a fly-wheel effect of the rotating cutter disk. Its momentum and electric power provides most of the cutting parts.

To obtain a copy of this bulletin on the Griductor, enter the above key number on a Reader Service Card, with your name and address.

215

SAFETY COLOR CODE

E. I. du Pont de Nemours Co., Inc., of Wilmington, Del., has issued two bulletins, one on **Color Conditioning for Industry,** and the other, a 4-page folder on the **Du Pont Safety Color Code.** The first and larger bulletin explains what color conditioning is and what it will do in painting an entire industrial plant. The use of color to aid in seeing various parts of the machines and equipment are presented, as well as the use of colors for safety work. A recent article in *Water and Sewage Works* has discussed the Safety Color Code.

To obtain these catalogs on the use of color in industry for improved efficiency as well as for safety, use a Reader Service Card on which is entered the above key number, and your name and address.

216
PLUG VALVES

The Homestead Valve Manufacturing Co., Inc., Coraopolis, Pa., has issued a new bulletin on the **Homestead-Reiser Self-Seald Lubricated Plug Valves.** The bulletin includes general catalog data, descriptions, specifications, prices on the units, parts and accessories.

To obtain a copy of this bulletin, use a Reader Service Card on which has been entered the above key number with your name and address.

217
CHLORINE

Columbia Chemical Div. of the Pittsburgh Plate Glass Co., 632 Duquesne Way, Pittsburgh 22, Pa., has just published a new technical manual, entitled **Chlorine.** This is the second in a series of technical data books, the first of which was the "Columbia Caustic Soda Manual." The present book on Chlorine was designed for use by operators, technicians, buyers, and executives. The new manual presents charts, diagrams, and photographic illustrations concerned with the production of chlorine and its several end products.

Of particular importance are detailed discussion and methods of manufacture, handling and loading, including safety precautions, shipment and equipment construction material.

Also imporant is the technical data section which presents some detailed studies of the properties of chlorine and the preparation and analysis of several bleach liquors, as well as detailed conversion information.

This 72-page text may be obtained by using a Reader Service Card on which is entered the above key number and your name and address.

218
COAGULATION EQUIPMENT

Walker Process Equipment, Inc., Aurora, Ill., has available a bulletin on the **Clariflow,** a unit for water softening, turbidity and color removal, trade waste treatment and recovery. This bulletin describes the construction and operation of the Clariflow with its upflow system of flocculation and sedimentation.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

219
FLUID METER DATA

Bailey Meter Co., Cleveland, Ohio, has issued a revised Bulletin No. 301-B, on **Bailey Fluid Meters for Steam-Liquids-Gases.**

The 40-page booklet is divided into ten different sections discussing, among other things, flow mechanisms, primary elements, integrators, auxiliary recorders, accessories, and installation features. Each section is illustrated with photographs and drawings and representative chart records are shown.

To obtain a copy of this bulletin enter the above key number and your name and address on a Reader Service Card and mail.

220
SANITATION EQUIPMENT

Hardinge Co., Inc., York, Penna., has available Bulletin No. 35-B on **Sanitation Equipment.** This bulletin includes information on the Hardinge Clarifiers, Circular Tank Clarifiers and the Hardinge Digesters.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number with your name and address.

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221

GEARED MOTORS

If you are interested in the **Syncrogear Motor** and how those gears are produced by the U. S. Electrical Motors, Inc., of 200 East Slauson Ave., Los Angeles 54, Calif., you will probably want to see a copy of the beautifully illustrated and printed bulletin on the U. S. Syncrogear motors. This catalog is as attractive as it is informative.

If you desire a copy of the catalog, enter the above key number and your name and address on a Reader Service Card and mail.

222

PACKING

Crane Packing Co., 1800 Cuyler Ave., Chicago 13, Ill., has issued an engineering manual known as **John Crane Hydraulic "O" Rings.**

This bulletin contains tabulations of compound specifications, dimensional standards, data on applications, installations, and drawings showing typical problems of "O" ring usage for packing.

A copy of this bulletin may be obtained by entering the above key number on a Reader Service Card and mailing to this magazine.

223

GAUGES

Whether you spell it gages or gauges, you will be interested in the bulletin on **Builders' Gauges for Water Works** issued by Builders-Providence, Inc., Providence 1, R.I.

This Bulletin DL-450 presents the mechanically operated type of gauge and shows their rate of flow, loss of head, water level, diaphragm pendulum units, and many others. Pictures of the various units are shown as well as an installation diagram. Pictures of typical plants with installations are also included in the bulletin.

To obtain a copy of this bulletin, enter the above key number on a Reader Service Card and mail.

224

FLEXIBLE COUPLINGS

Chain Belt Co. of Milwaukee has issued a new catalog on the **Baldwin-Rex Roller Chain Flexible Couplings.** This new booklet presents a complete story of these couplings, their design, application, selection, and prices.

Diagrams of five types of shaft misalignment are shown.

A copy of this book, Bulletin No. 48-6, may be obtained by entering the above key number on a Reader Service Card.

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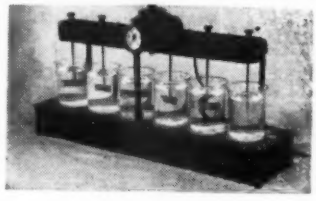

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225

PLUG VALVES

The Nordstrom Division of Rockwell Manufacturing Co., Pittsburgh 8, Pa., has published a story in their bulletin, the **Flow Line,** on the development, application and use of plug valves in comparision with other valves. This is a complete and informative story, which should be of interest to operators in the water and sewage works fields.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

226

pH AND CONDUCTIVITY

The Brown Instrument Co., Division of the Minneapolis Honeywell Regulator Co., Philadelphia 44, Pa., has produced a bulletin on **pH and Conductivity Recorders and Controllers.** This catalog fully illustrates with photographs and diagrammatic diagrams the use of the equipment for control of pH and conductivity in the various industries, including water treatment.

To obtain a copy of this bulletin on recorders and controllers for pH, use a Reader Service Card on which is entered the above key number and your name and address.

227

DRIVE CHAINS

The Jeffrey Mfg. Co., Columbus 16, Ohio, has published a bulletin on **The Jeffrey Steel Thimble Roller Drive Chains.** This 58-page bulletin contains information on these drive chains for every class of service.

The bulletin is filled with pictures of the plant, pictures of the various types of chains, descriptions of the chains and arrangements, data on chains, and the horsepower ratings as well as size.

For persons interested in the use of roller chains this bulletin will serve as a handy reference. To obtain a copy use a Reader Service Card on which is entered the above key number and your name and address.

228

REGISTER INDICATOR RECORDER

Builders-Providence, Inc., Providence 1, R. I., has issued a 4-page bulletin on the **Builders Type M Register Indicator and Recorder.** This unit is shown in pictures and diagrams and its application is also shown for normal and high heads, for low heads, and for distant transmission and summation attachments.

To obtain a copy of this bulletin, use a Reader Service Card on which is entered the above key number and your name and address.

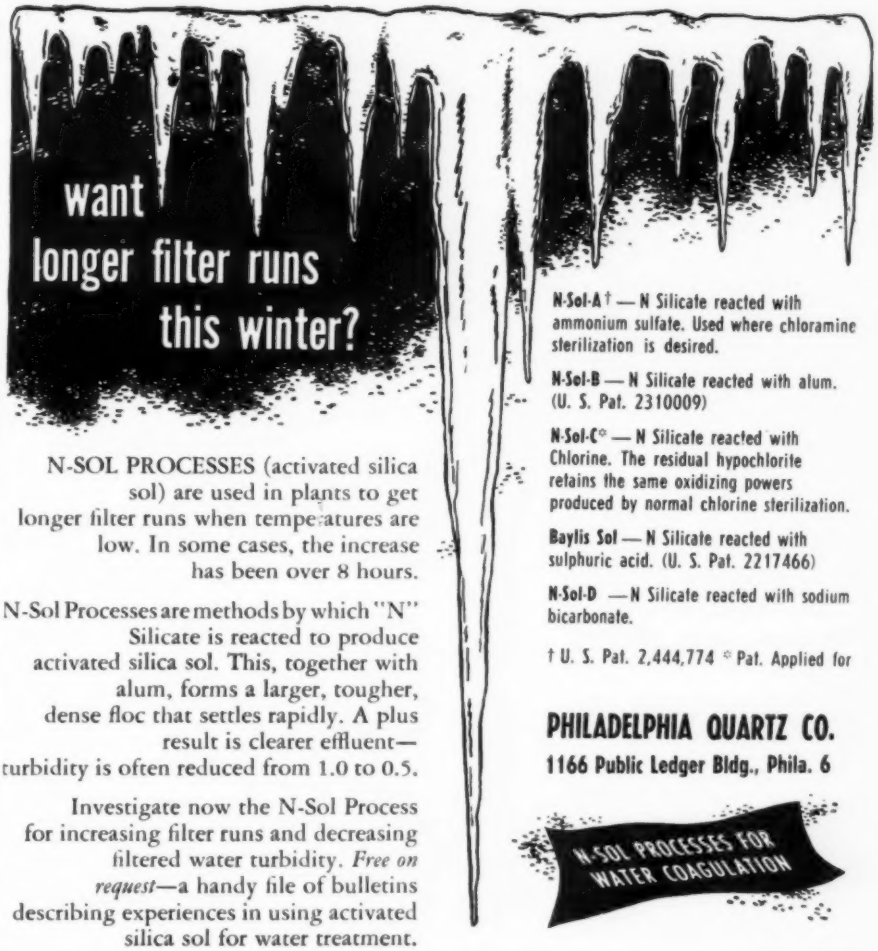
229

SPAULDING PRECIPITATOR

The Permutit Co., 330 W. 42nd St., New York 18, N.Y., has just issued Bulletin No. 2204 on the **Permutit Spaulding Precipitator.**

This 12-page bulletin shows the diagrammatic design and operation of this upflow precipitator for use in water softening. Among the many things discussed in the bulletin are principles of operation, precipitator design, advantages of this precipitator, features of the precipitator in cold lime softening, special applications of precipitator, and water softening for railroad use. The bulletin is amply and well illustrated with pictures and diagrams.

This bulletin should be of interest to all persons concerned with water softening. A copy of the bulletin may be obtained by entering the above key number on a Reader Service Card and mailing same to this magazine.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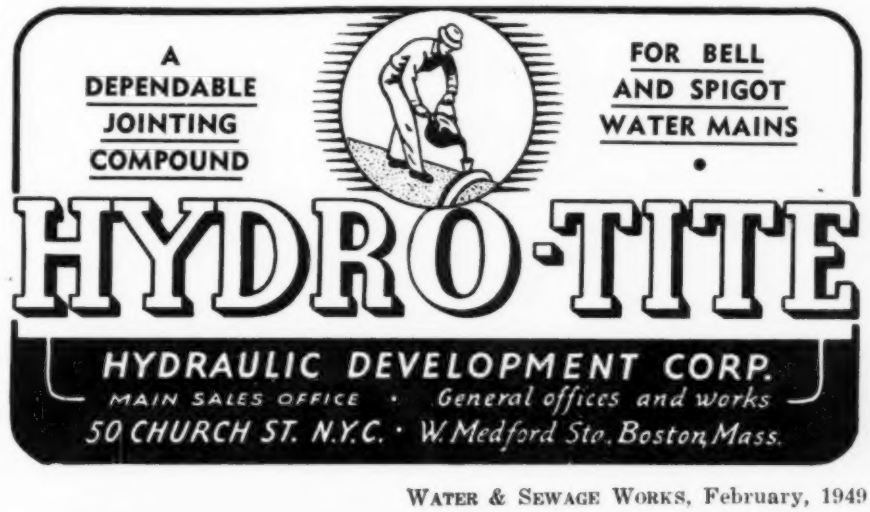
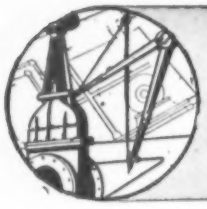
230

CHECK VALVE

Grove Regulator Co., 65th & Hollis Sts., Oakland 8, Calif., has issued a new bulletin describing the operation and performance of Grove **Chex-Flo Check Valves** of the expansible tube type. These may be employed on air, gas, oil, or water at temperatures not exceeding 159 deg. F.

To obtain a copy of this bulletin on these check valves, use a Reader Service Card on which is entered the above key number and your name and address.





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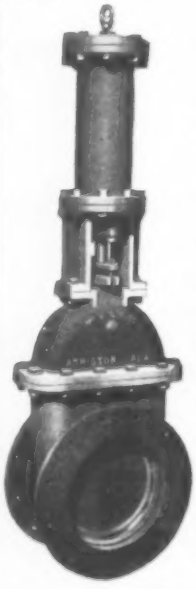

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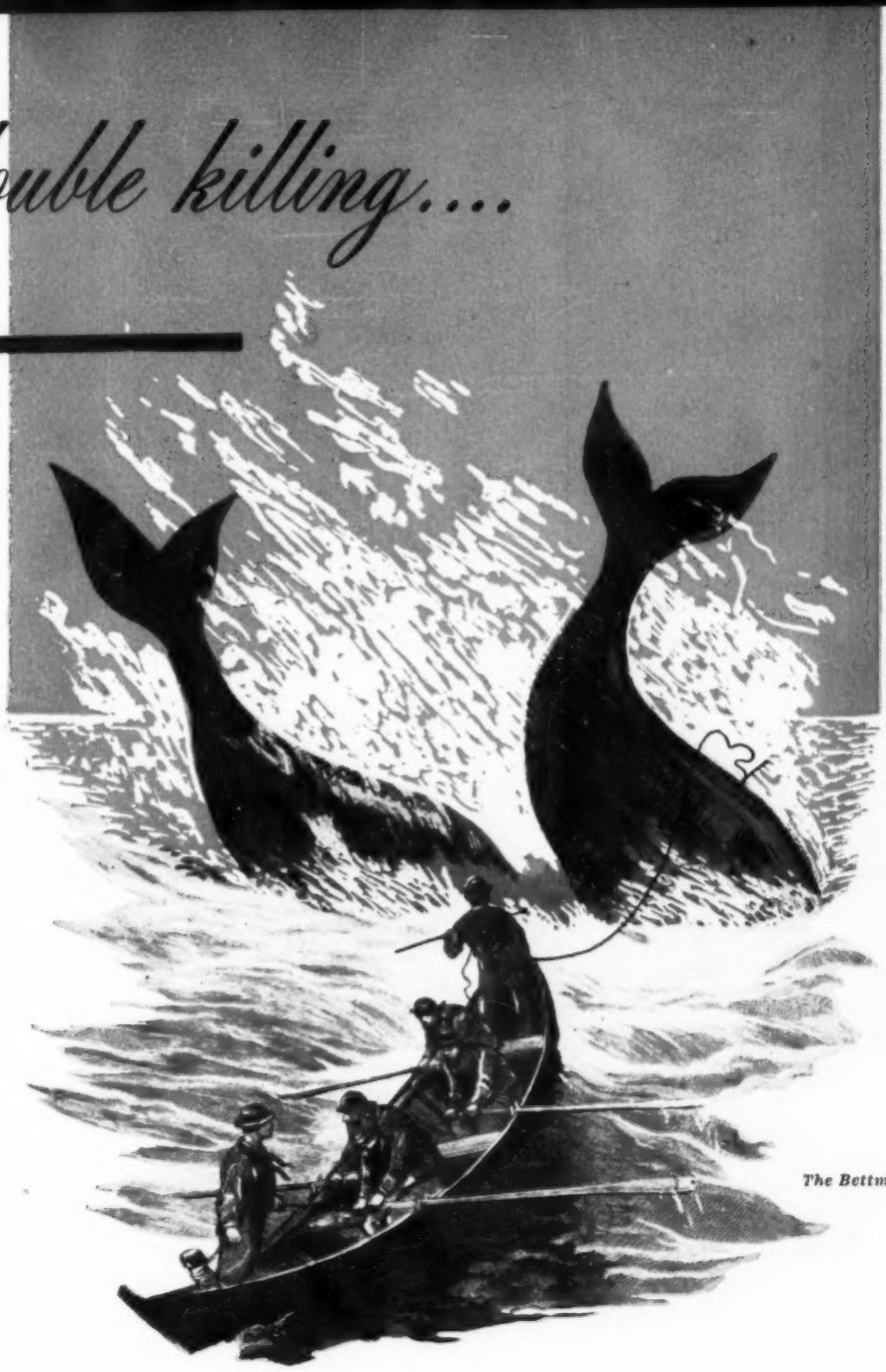

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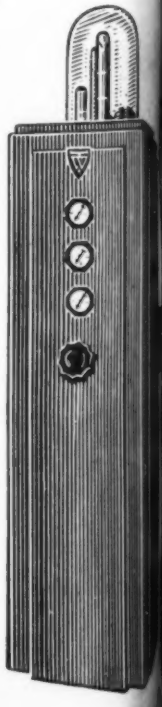

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